

Arcata Field Office EA Cover/Routing Sheet

EA Title: Japanese Knotweed Control Protocol: Arcata Field Office

EA #:CA330-06-07

Review

Requested ☒

Name

Signature

Date

*Critical Elements/
Programs*

X	Bruce Cann			Recreation, Wilderness & WSAs, Wild and Scenic Rivers, VRM
X	Kynan Barrios			Law Enforcement, Public Health/Safety
X	Dave Fuller			Water Quality, Floodplains, Wetlands/Riparian Zones, Aquatic Spp. And Habitat (incl. T&E, Ess. Fish Habitat)
X	Marlene Grangaard			Cultural, Native American Religious Concerns
X	Hank Harrison			Forest Vegetation
X	Charlotte Hawks			Realty
X	Brad Job			Hazardous & Solid Waste
X	Tim Jones			Air Quality
X	Amy Krause			Terrestrial Wildlife and Habitat (Incl. T&E)
X	Sam Morrison			Geology/soils
X	Jennifer Wheeler			Prime or Unique Farm Lands, Invasive Species, Vegetation (Incl. T&E)
X	Bob Wick (Last)			Areas of Critical Environmental Concern, Environmental Justice, Social/Economic

King Range NCA

X	Scott Adams			Recreation, Wilderness, Wild and Scenic Rivers, VRM
X	Gary Pritchard-Peterson			King Range Manager



Japanese Knotweed Control Protocol Arcata Field Office

EA # CA-330-06-07

Date: August 22, 2006

Bureau of Land Management
Arcata Field Office
Arcata, CA

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Introduction

Need for the Proposed Action

The purpose of this action is to develop an effective program to eradicate Japanese knotweed (*Polygonum cuspidatum*) and its relatives when infestations are found on public lands. Without an effective control program, the rapid spread of this weed would cause severe impacts to native riparian vegetation, fish and wildlife habitat, and facilities such as trails and parking areas. Having this EA completed and ready to implement ahead of anticipated infestations will allow the BLM to respond quickly with treatment protocols, resulting in no or minimum levels of herbicide having to be utilized.

Japanese Knotweed (*Polygonum cuspidatum*) has recently been detected on and adjacent to public lands under the jurisdiction of the BLM, Arcata Field Office. It occurs at the BLM Ma-le'l Dunes Area of Critical Environmental Concern and at seven locations along the terminal five miles of the Mattole River between Lighthouse Road and the river, where BLM is the owner and manager of the Mattole Estuary Area of Critical Environmental Concern. The Humboldt-Del Norte Weed Management Area has produced a list of known sites for the area that includes knotweed occurring in over 15 other locations in Humboldt County, and over 12 locations in Del Norte County. Difficulty with control and the high potential for spread is a major concern. While only Japanese knotweed is generally referred to in this document, other closely related *Polygonum* species shall be considered equivalent targets, including giant knotweed (*Polygonum sachalinense*) and Himalayan knotweed (*Polygonum polystachyum*); and/or any hybrid crosses thereof.

Japanese knotweed is native to eastern Asia and was introduced from Japan as an ornamental garden plant in the late 1800's. It is now widely distributed in much of the eastern U.S., and occurs in coastal areas of Oregon and Washington. Japanese knotweed is a riparian species that spreads quickly to form dense tall thickets that shade out other species and prevent regeneration of native plants. In the winter, when knotweed canes die back, bare ground along river banks are exposed which dramatically increases erosion. Japanese knotweed poses a significant threat to riparian areas where it can survive severe floods and is able to rapidly colonize scoured shores and islands (Alien Plant Working Group, 2004b). Once established, populations are extremely persistent. Japanese knotweed reduces species diversity and damages wildlife habitat (Sieger, 1991).

Rhizomes are extensive, and can reach 15-20 meters laterally, and 2-3 meters in depth. Rhizomes can regenerate from small fragments, even just 0.7 grams of rhizome is capable of producing a new plant. Dispersal can occur naturally when rhizome fragments are washed downstream and deposited on banks, or more commonly, when humans transport soil as fill dirt (Sieger, 1991). Rhizome fragments can regenerate even if buried up to 1 meter deep and have been observed growing through two inches of asphalt.

Japanese knotweed can form adventitious roots from above ground plant parts when they come into contact with a rooting medium such as soil, cobble, or water. Shoots generally begin to emerge in April and growth rates exceeding 8 centimeters per day have been recorded. Monitoring for the introduction of Japanese knotweed and manually removing the entire plant can prevent establishment. Repeated cutting may control small stands, but the only known method to eradicate large stands is with repeated application of herbicide (Seiger, 1991). Innovative herbicide applications such as stem injection are being used with success and can mitigate effects to non-target species (Soll, 2004).

The California Department of Food and Agriculture has given Japanese knotweed a pest rating of “B”; an organism of known economic importance subject to: eradication, containment, control or other holding action at the discretion of the individual county agricultural commissioner. Japanese knotweed is considered one of the most serious riparian weeds in the northwestern U.S.

Conformance with Land Use Plan

This EA conforms with the following programmatic EIS’s and land use plans that direct management of BLM lands by the Arcata Field Office:

1988 California Vegetation Management EIS

2005 draft Vegetation Treatments Using Herbicides on Bureau of Land Management Lands in 17 Western States Programmatic Environmental Impact Statement, November 2005.

2005 King Range National Conservation Area Resource Management Plan and Final Environmental Impact Statement

TEV.1.10.4: An Integrated Pest Management approach would be applied to all invasive non-native species infestations. Removal of invasive plant species by manual means is the preferred method of eradication, and would be utilized wherever possible. The use of herbicides would be restricted to specific situations when all other alternatives are determined to be unfeasible and ineffective. Any proposed use of herbicide would be conservative, targeting specific weed individuals for a given species. Any herbicide use would be assessed using the NEPA process and would be made available for public comment.

1995 Arcata Planning Area Resource Management Plan Amendment and EA

P 2-8: Any herbicide use will be consistent with procedures and limitation outlined in the California Vegetation Management ROD (USDI BLM 1988b). Herbicide use will also comply with the applicable management objectives and standards and guidelines of the NFWP. Those standards and guidelines providing the greater benefits to late-successional forest-related species will apply.

1995 Environmental Assessment and Land Use Decision Amendment for the Samoa Peninsula Management Area Arcata Resource Area

Management Area/Land Use Decision III.6. Conduct dune restoration and exotic plant removal.

The 2003 Headwaters Forest Reserve Proposed Resource Management Plan and Final EIS/EIR states that “No herbicides will be used in the Reserve”. The risk of knotweed introduction into the Reserve is low as there are very limited urban interface opportunities as well as very limited vehicular access. There are currently no known infestations in or near the Headwaters Forest Reserve. Prevention, early detection, and immediate manual response will be the protocol for Headwaters Forest Reserve should there be an introduction of this invasive weed. Therefore, no herbicide use is proposed under this EA for BLM lands making up the Headwaters Forest Reserve and these lands are excluded from analysis under this EA.

Relationship to Statutes, Regulations or Other Plans

This EA is tiered to the California Vegetation Management Final Environmental Impact Statement completed in August, 1988 and utilizes the guidelines and methods approved for vegetation management in this document. This proposal also meets the "Purpose and Need" set forth in the Vegetative Treatment on BLM Lands in Thirteen States Final EIS of May 1991.

Other Authority

- A. Federal Land Policy and Management Act of 1976 (43 U.S.C. 1701-1712)
- B. Carlson Foley Act of 1968 (P.E. 90-583) – Provides the authorization for reimbursement of expenses to State or local agencies for weed control on Federal lands.
- C. Federal Noxious Weed Act of 1974 (7 U.S.C. 2801-2813) as amended by Sec. 15, Management of Undesirable Plants on Federal Lands 1990
- D. Departmental Manual 517 – Prescribes the Department’s guidance for the use of pesticides on the land and waters under its jurisdiction and for compliance with the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA) as amended.
- E. Executive Order 13112, Invasive Species.

Proposed Action and Alternatives

Proposed Action

The proposed action is to manage Japanese Knotweed infestations through; 1) prevention, 2) early detection, and 3) integrated pest management, as they are identified on BLM lands managed by the Arcata Field Office.

Prevention:

Preventing massive ecological spread of Japanese knotweed is dependent upon rapid detection and removal of all visible plants and associated root systems. Typically, knotweeds become major invaders in riparian environments. Preventing knotweeds from growing near riparian areas is critical. Along waterways; rhizome fragments break off, and are transported by water to new sites downstream.

Through active participation with the Humboldt-Del Norte Weed Management Area (HDNWA), the BLM will contribute to ongoing public outreach efforts. Outreach efforts will promote recognition, expedient reporting to local authorities of any new infestations, garden alternatives to planting invasive, non-native species, and safe and effective eradication methods. The BLM will support the HDNWA in providing public outreach efforts including a nursery program encouraging the prohibition of sale of invasive, non-native species; availability of posters and brochures citing alternatives to such plants, County Fair educational booths, educational weed videos distributed throughout schools, and special “weed week” community events.

Early Detection:

Arcata Field Office staff will be trained in the identification of Japanese knotweed and related species. Field staff will report any findings to the Arcata Field Office invasive weed coordinator who will implement a control and/or containment response.

Control:**A) Manual Only Phase**

The primary, “manual only” approach to eradication will focus on careful, hand excavation of all accessible above ground vegetation and below ground, rhizomatous portions of the colony. Complete eradication through manual methods is only possible if all rhizomes (and rhizome fragments) can be removed and or exhausted of carbohydrate (CHO) reserves. This is extremely labor intensive and requires diligent, biweekly, follow-up treatments during the growing season (generally April through November), which would be repeated in subsequent growing seasons. If available resources are not available in a given year to completely eradicate an infestation through manual removal, and it seems feasible that the site could be completely eradicated with manual methods alone, then the site will be contained until funds are secured to remove as much vegetal and rhizome mass as is ultimately practical or possible. Above ground portions of the plant will be cut by hand, (or possibly reduced through goat grazing in uniform stands of knotweed), to temporarily contain the infestation without risking spread through mechanical methods such as weed eating or mowing. Vegetal and rhizomatous biomass will be taken to a green waste co-generation plant for incineration or otherwise removed, dried and burned. If an infestation is determined to be eradicable using the manual only approach, over a course of several years, with available BLM staff, funding, or volunteer labor efforts, then the manual approach will be the only approach employed.

Prior to manually excavating a Japanese knotweed site on public lands, cultural staff shall be contacted for pre-treatment inspection to assess whether significant archaeological resources are present. Cultural staff may elect to be present throughout the entire project, or depending upon any sensitivity of the site, the project may not proceed manually. In which case, treatment will be authorized to proceed using herbicides such that soil layers are not disturbed. Cultural and field manager authorization for treatment would be documented.

Further, prior to manually excavating a Japanese knotweed site on public lands, botanical staff shall ensure that no federally listed plant species are found to be growing within the area that would be impacted by knotweed eradication activities, and if so the appropriate consultation and conservation measures would be employed.

B) Integrated Phase

The secondary, “integrated” phase to eradication will focus on using the manual method (A), in concert with herbicide application as outlined in Table 1. This technique will be employed where 1) the infestation is an immediate ecological threat to riparian or estuarine resources, 2) the infestation is too large or otherwise not logistically feasible for hand treatment alone, and/or 3) the infestation threatens destruction of facilities, such as trails, parking lots, etc. and/or 4) implementation of the manual method would cause significant impacts to other resources such as riparian habitat, fish habitat, water quality, etc. After implementing as much “manual only” removal as described above, subsequent cutting of above ground shoots/vegetation will be followed with herbicide applications. The benefit to using the integrated approach as a second tier of eradication is that, ideally, with the majority of rhizome mass already manually removed from primary eradication efforts, the amount of herbicide needed to effectively kill the remaining rhizome fragments that are too deep or otherwise inaccessible will be dramatically reduced. Further, because of the preceding manual removal efforts, there will be more new shoots per linear foot of root, which will lead to greater eradication success by more rapidly exhausting carbohydrate root reserves, followed by further manual removal or herbicide application.

Where herbicides are applied, public notice via on site postings will provide general public awareness. Educational signing will include telephone contacts for further information. Further, tribes, permittees and others who may be collecting vegetative materials from the area will be contacted prior to herbicide application.

As described in the product label, the combined total for all applications must not exceed 8 quarts per acre per year for a given treatment. If stem injection is the only application method used, a maximum of 1,514 stems per acre may be treated with 5 milliliters per stem or a 100% solution, or 10 milliliters of a 50% solution. Maximum knotweed treated at a given site might be attained by combining application methods such as the stem injection with the cut stem method at reduced application rates (as low as 2.5ml of 100% solution, or 5ml of 50% solution), as well as with the low volume, directed foliar spot spray at a 5% rate for small stems that haven’t yet developed a hollow center.

As a guide, stem injection will be the preferred application method for knotweed plants that have adequately sized canes (hollow stems). For secondary resprouts, or infestations that lack adequately sized canes to enable stem injection, either wick or low volume foliar spray application methods may be used. When utilizing these application methods, the wick application method will be used closest to any free-standing water edge so as to eliminate opportunity for surfactant contact with the water. The low-volume foliar spray application method may be used farther away from free-standing water such that there is no opportunity for incidental contact due to application drift.

Table 1: Herbicide proposed and recommended for effective control of Japanese knotweed.

Herbicide- active ingredient (Trade Name) (Manufacturer) Selectivity	Approved for Aquatic or Upland Use	When to Apply
<p>Glyphosate (Aquamaster™) Monsanto</p> <p>Broad spectrum, Nonselective and systemic</p>	<p>Both</p> <p>Non-restricted herbicide in California.</p>	<p>Most effective after plant flowers through to late fall when leaves are translocating to rhizomes. However with stem injection, can use as early as April.</p>
Proposed Application Method(s)	Manner of Effectiveness and Decomposition Process	Concerns and Benefits
<p>See attached Aquamaster™ label for more information of the following methods:</p> <p>Stem injection: Use JK injection system, a totally closed system (herbicide is contained within injector unit and delivered through syringe directly into plant stalk). Inject 5 mls of 100% Aquamaster™ below the second or third node above the ground of each stem in the clump. For more information check the internet at http://www.jkinjectiontools.com/</p> <p>Cut stem: Cut stems cleanly just below the 2nd or 3rd node above the ground. Immediately apply 10ml of a 50% solution of Aquamaster™ into the ‘well’ or remaining internode.</p> <p>Low volume directed, foliar spot spray (using 5% Aquamaster™ solution in water) for follow up of small diameter stems that are too small for injection.</p> <p>Wick: 33-75% solution may be used.</p>	<p>Glyphosate acts through interrupting a metabolic pathway specific to plants; inhibiting biosynthesis of tyrosine and phenylalanine (two amino acids used in protein synthesis)</p> <p>Field half-life: 47 days >70% product applied converted to CO₂ by end of season. Remainder metabolized by soil bacteria that use it as food source.</p>	<p><u>Surfactants:</u></p> <p>Stem Injection: Surfactant not required. Stem injection method the most effective and safest herbicide delivery system known to eradicate hollow stem plants</p> <p>Other external application methods: Non-ionic surfactant required for wick or low volume directed, foliar spot spray. These methods will apply for treatment or re-treatment situations where knotweed lacks adequately sized cane development.</p>

Monitoring:

Site revisits following herbicide use will occur from one to two weeks after application in order to visually confirm signs of mortality in treated plants. Site monitoring will also serve to provide qualitative observations by any non-target vegetation that may be presenting with treatment symptoms. Annual site monitoring will continue for five years after the site has been proclaimed controlled/eradicated to ensure eradication was in fact successful. A knotweed treatment log book will be created for each infestation site that will track manual efforts, herbicide use, and follow-up monitoring.

Alternatives

Alternative 1: No invasive weed management; allow non-native plant introductions to colonize freely.

No intervening management would be taken to control Japanese knotweed on BLM lands under the Arcata Field Office jurisdiction. New infestations would be allowed to reproduce at their own rate.

Alternative 2: Manual/Mechanical Methods only, no herbicide use (continuation of existing management; the no action alternative).

This approach to eradication will focus on careful, hand excavation of all accessible above ground vegetation and below ground, rhizomatous portions of the colony. Complete eradication through manual methods is only possible if all rhizomes (and rhizome fragments) can be removed and/or exhausted of carbohydrate (CHO) reserves. This is extremely labor intensive and requires diligent, biweekly, follow-up treatments during the growing season (generally April through November), which would be repeated in subsequent growing seasons. If available staff or funds are not available in a given fiscal year to completely excavate an infestation through manual removal, then the site will be contained until funds are secured. Ideally, inaccessible underground portions of the colony will be exhausted through repeated above ground vegetation removal. However, where there are inaccessible above ground portions of the colony; it follows that the below ground rhizomes associated with that portion of the colony will remain. Containment therefore may be the highest and best goal for such infestations. Above ground portions of the plant will be cut by hand, (or possibly reduced through goat grazing in uniform stands of knotweed), to temporarily contain the infestation without risking spread through mechanical methods such as weed eating or mowing. Vegetal and rhizomatous biomass will be taken to a green waste co-generation plant for incineration or otherwise removed, dried and burned. Erosion control measures between treatment seasons will be applied to the excavation site if the period of rest occurs during the wet season.

Prior to manually excavating a Japanese knotweed site on public lands, cultural staff shall be contacted for pre-treatment inspection. Cultural staff may elect to be present throughout the entire project, or depending upon any sensitivity of the site, the project

may not proceed manually until such time as cultural staff and native American representatives can be present.

Further, prior to manually excavating a Japanese knotweed site on public lands, botanical staff shall ensure that no Federally listed plant species are found to be growing within a knotweed infestation.

Alternatives Considered but Rejected from further consideration.

Biocontrol: There are currently no registered biological control agents for use on any of the knotweed species. Biocontrols are still being researched in its native habitat in Japan.

Covering/Solarization: The use of covering in conjunction with cutting was considered. Several layers of black plastic or shade cloth would be placed over the area and weighted down by blocks, mulch or stones. This should be done either after cutting or when plants are fully grown for the season since this species is capable of emerging up through asphalt. Although there may be some benefit from covering, no reports of successful long term control using covering alone have been found. Furthermore, covering may stimulate lateral rhizome spread and increase the size of the infestation. Many riparian slopes or habitats are not conducive to the covering method. Approval of this EA would not preclude the incorporation of covering as an integrated method in the future if it is determined to be beneficial.

Heavy equipment: The use of heavy equipment to remove larger infestations is not a reasonable alternative because in addition to root mass; large amounts of soil would be removed as well; which would require additional labor for diligent separation of roots and soil such that the roots could be successfully accepted by cogeneration plants and incinerated. Soil waste could be contaminated with small root fragments, and would have to be composted and monitored for several years before spreading it into a knotweed free area. The chance of knotweed introduction to a clean area is too high with the use of heavy equipment for its use to be considered to be effective.

Affected Environment

General Setting

Japanese knotweed may affect any of the lands in the Arcata Field Office, characterized as the North coast range within the California Floristic province. The affected environment will be discussed in terms of where the knotweed currently exists, where it is next likely to infest, what the most susceptible types of habitats are, and generically, the remainder of the Arcata Field Office.

Known infestation: Ma-le'l Dunes

The Ma-le'l Dunes are located on the north spit of the Samoa Peninsula adjacent to the BLM Manila Dunes Area of Critical Environmental Concern and three miles north of the town of Manila. Acquired in 2004, previous landowners used these lands as an unimproved parking area to an Off-Highway-Vehicle club. Since BLM acquired the

area, the parking area has been improved with packed gravel, post and cable barriers, signage, restrooms, and picnic tables. The water table is relatively high beneath the soil surface, about 4-10 feet deep depending upon precipitation. Adjacent to the parking area there are degraded dunes infested with annual grasses and yellow bush lupine, with small pockets of native dune mat plants, such as yellow sand verbena (*Abronia latifolia*) and coast buckwheat (*Eriogonum latifolia*). Two colonies of Japanese knotweed existed prior to BLM parking lot improvements. However, the colonies were dormant and BLM did not know, at that time, the persistent and dynamic abilities of the plant. Equipment spread the rhizomes around the parking lot area. The area is managed for day-time, non-motorized recreation use and natural study and research.

Anticipated infestation: Mattole River estuary

The BLM manages the Mattole Area of Critical Environmental Concern within the King Range National Conservation Area. This area is managed for natural and cultural resources, pedestrian recreation, and overnight camping. There is one endangered plant species, beach layia (*Layia carnosa*) on the dunes, and a CNPS 1B rare marsh milk vetch (*Astragalus pyncnostachys* var. *pyncnostachys*) that inhabits the back dunes adjacent to and influenced ephemerally by the estuary. Upriver, and adjacent to Lighthouse Road and encroaching upon the river edge, are six discreet Japanese knotweed infestations (**SEE MAP A**) that were discovered in 2004 and 2005 of various sizes, and degrees of accessibility/inaccessibility. While these infestations are now under the attention of the Mattole Restoration Council, Humboldt County Department of Public Works, and private landowners; and containment efforts are underway, these populations pose a real threat downstream to public lands. The most western most population is about 200 yards from public land and is now in the river proper.

Susceptible habitats: Riparian, estuarine, or other areas with high water tables.

Within the Arcata Field Office, there are hundreds of miles of riparian/wetland habitat. Riparian habitats with flowing water are the most susceptible habitats for epidemic spread of Japanese knotweed. Public lands are regularly used for dispersed recreation. Potential vectors for introductions to riparian habitats are largely human induced such as illegal yard waste dumping, or garden escape through bird or other animal activity, or even natural reproductive modes of spread.

Remainder of BLM lands in field office:

Any of the approximately 200,000 acres of public land within the Arcata Field Office could become infected with Japanese knotweed. However, areas influenced by free standing water (such as roadway ditches), intermittent streams, ephemerally flooding, or river courses are clearly at highest risk.

Affected Resources

Summary Table- Proposed Action

Critical Elements of the Human Environment

The following elements of the Human environment are subject to requirements specified in statute, regulation, or executive order and must be considered in this EA.

Table 1. Critical Elements of the Human environment that have been considered for this environmental assessment (EA) are listed below. Elements that may be affected are further described in this EA. Rationale for those elements that will not be affected are listed in this table.				
Critical Element	No Impact	May Impact	Not Present	Rationale
Air Quality	X			The activities inherent to the proposed action are not of the nature and scope that would affect this element. The vapor pressure for glyphosate is very low; the fate pathway of this herbicide through volatilization is nonexistent (Franz et al. 1997).
Areas of Critical Environmental Concern		X		
Cultural Resources		X		
Environmental Justice	X			No minority or low income groups would be affected by disproportionately high and adverse human health or environmental effects because the proposed project has low probability of causing significant environmental consequences.
Farmlands, Prime or Unique			X	This element is not present within or near the area determined to be influenced by the alternatives considered.
Floodplains			X	This element is not present within or near the area determined to be influenced by the alternatives considered.
Invasive, Nonnative Weed Species		X		
Native American Religious Concerns		X		
T&E Wildlife	X			This element is not present within or near the area determined to be influenced by the Proposed Action.
T&E Fish		X		
T&E Vegetation	X			This element is not present within or near the area determined to be influenced by the alternatives considered
Waste- Hazardous/Solid	X			No hazardous materials or solid wastes would be produced as a result of the proposed action.
Water Quality: surface/ground	X			The activities inherent to the proposed action are not of the nature and scope that would affect this element. Glyphosate is highly soluble in water; and is readily eliminated from water through sediment adsorption and microbial degradation (Schuette, 1998) Studies conducted in forested ecosystems (Feng et al., 1990; Goldsborough et al., 1993; Newton et al., 1994) found

				that glyphosate dissipated rapidly from surface water ponds high in suspended sediment, with first order half lives ranging from 1.5 – 11.2 days. In streams, residue was undetectable in 3-14 days. For all aquatic systems, sediment appears to be the major sink for glyphosate residue. Regarding adjuvant addition of non-ionic surfactant for treatment of knotweed resprouts with the wick or foliar spray application method(s); there is a wide margin of safety for aquatic organisms when herbicide and surfactant labels are followed correctly (Langeland, 2006). Surfactant (a frequent ingredient of many household items and therefore commonly present in residential grey water) rapidly breaks down when adsorbed to soil/sediment; and will not be directly applied to water under any application scenario.
Wetlands/Riparian		X		
Wild & Scenic Rivers	X			While there are no Wild and Scenic Rivers that are currently infected with Japanese knotweed, there could be at some time in the future. Rapid response and treatment of a potentially river altering invasive weed will not impact the Wild and Scenic river, but rather, will help preserve its character which led to its designation in the first place.
Wilderness/Wilderness Study Areas	X			While there are no Wilderness/Wilderness Study Areas currently infected with Japanese knotweed, there could be at some time in the future. Rapid response and treatment of a potentially habitat altering invasive weed will not impact the Wilderness/Wilderness Study Area(s), but rather, will help preserve its character which led to its designation in the first place.

Areas of Critical Environmental Concern

Areas of Critical Environmental Concern (ACECs) are areas of public land where special management attention is required to protect important natural and/or cultural resource values. The ACEC designation indicates to the public that the BLM recognizes these significant values, and has established special management measures to protect them.

There are three ACEC's that are present in the project area that could be impacted in the short-term (anticipated infestations) by Japanese knotweed and its treatment; the 112-acre Manila Dunes ACEC, the 655-acre Mattole Estuary ACEC and the 680 acre Mill Creek watershed ACEC. The current infestation is present at the newly acquired 40-acre Ma-le'l Dunes parcel which is adjacent to the Manila Dunes ACEC. While the Ma-le'l dunes parcel requires a land use plan amendment to formally include it within the ACEC, it is managed for the same goals as the Manila Dunes ACEC as per the Arcata RMP 1992. The Mattole Estuary is designated as an ACEC because of its significant archeological sites, the fragile sand dune ecosystem, and riparian areas/wildlife values. While it is not currently infected with Japanese knotweed, there are at least six infestations upstream of the estuary that could lead to infestation at any time, particularly with high water flows. In addition, the Mill Creek ACEC, adjacent to Lighthouse Road where the current Japanese knotweed infestations exist near the Mattole River, is at risk of infestation. The primary features of the Mill Creek watershed ACEC that are to be protected are the water

quality of this important anadromous fish stream/cold water tributary to the Mattole River, and the low-elevation old-growth Douglas fir forest.

Other ACEC's in the field office are remote, and very unlikely to be infected with Japanese knotweed. These areas have been designated to protect old-growth forests, rare vegetation, and/or watershed values.

Cultural Resources - Cultural resources and native American concerns are present throughout lands managed by the Arcata Field Office. They could consist of prehistoric, historic, or traditional areas.

Invasive Species – While invasive species are not a resource in the classic sense of the word, they are present in the project area. In particular, Japanese knotweed is present in the Arcata Field Office jurisdiction.

Social/Economic Resources – There are complex and varying social community values within many rural communities within the Arcata Field Office jurisdiction. For example, in the Mattole Valley, there are many community members who form a conscientious and proud contingent that believe firmly in sustainable and healthy ecosystems through organic, and consensus based resource management methods. Economically speaking, many rural communities subsist through agri-business and rural related odd jobs. Sometimes rural community groups are able to obtain grants to employ local community members to assist with various ecological projects. Sometimes federal agencies provide funds to local rural groups to assist in ecological projects as well.

Recreation – Concentrated and dispersed recreation occurs on all publicly accessible land managed by the Arcata Field Office.

T&E Fish Species

The Arcata Field Office manages approximately 120 miles of anadromous fish streams in the Eel River basin, Mattole River basin, Redwood Creek, Humboldt Bay tributaries, and various coastal streams. Pacific salmon species are listed under the federal Endangered Species Act as Evolutionarily Significant Units (ESU) and Distinct Population Segments (DPS). The listed Pacific salmon managed by the Arcata Field Office includes three ESUs and one DPS which are listed as threatened: Southern Oregon/Northern California Coasts (SONCC) coho salmon (*Oncorhynchus kisutch*), Central California Coast (CCC) coho salmon (*Oncorhynchus kisutch*), California Coastal (CC) Chinook salmon (*Oncorhynchus tshawytscha*), and Northern California (NC) steelhead (*Oncorhynchus mykiss*). Critical habitat has been designated for nearly all areas where these ESUs and DPS occur throughout the Arcata Field Office lands.

The tidewater goby (*Eucyclogobius newberryi*) is found in the Mattole River estuary and in Humboldt Bay. The tidewater goby is listed as endangered but no critical habitat is designated along the north coast of California.

Wetlands/Riparian

The Arcata Field Office manages 374 miles of stream channels ranging from small, intermittent channels to large rivers such as the Mattole River. The BLM has assessed these channels using the Proper Functioning Condition protocol which analyzes stream processes to determine the whether a stream can withstand a large flood even without large scale erosion and other environmental damage. Of the 374 miles assessed, 219 miles are “Properly Functioning” and 155 miles are “Functional At-Risk” which means the processes are in place to be rated a properly functioning but risk factors are present.

The Arcata Field Office manages 140 acres of wetlands, of which 135 acres were assessed as “Properly Functioning” and the remaining five acres were determined to be “Functional At-Risk”.

Vegetation - The project area is located within the North coast range of the California Floristic Province. Vegetation is diverse and ranges from coastal prairies to old-growth forests. The anticipated specific project sites will likely involve areas of typical riparian vegetation including such native species as red alder (*Alnus rubra*), willow (*Salix* sp.), thimbleberry (*Rubus parviflora*), and sedge (*Carex* sp.).

Wild and Scenic Rivers – The Wild and Scenic Rivers Act, (Pub. L. 90-542 as amended; 16 U.S.C. 1271-1287) established a method for providing Federal protection for certain of our country's remaining free-flowing rivers, preserving them and their immediate environments for the use and enjoyment of present and future generations. Rivers are included in the system so that they may benefit from the protective management and control of development for which the Act provides.

The preamble of the Act states:

It is hereby declared to be the policy of the United States that certain selected rivers of the Nation which, with their immediate environments, possess outstandingly remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values, shall be preserved in freeflowing condition, and that they and their immediate environments shall be protected for the benefit and enjoyment of present and future generations.

BLM Arcata Field Office manages portions of the Eel River system that are designated Wild and/or Scenic under national designation. Currently, none of the Wild and Scenic River segments BLM manages are known to have infestations of Japanese knotweed.

Wilderness/Wilderness Study Area(s) - The 1976 Federal Land Management Policy Act required the Bureau of Land Management to identify potential wilderness areas under its jurisdiction. In 1991, the agency released its statewide wilderness study report, which identified 7.1 million acres of potential wilderness areas across California. These areas

are known as "wilderness study areas". Wilderness Study Areas must be managed to preserve their wilderness values until Congress can act to either designate these areas as wilderness or to open them to other uses. This means that, in the interim, these areas are managed in a manner similar to wilderness areas.

BLM Arcata Field Office currently manages six Wilderness Study Areas; King Range WSA, Red Mountain WSA, Thatcher Ridge WSA, Big Butte WSA, Eden Valley WSA, and Chemise Mountain WSA.

BLM also manages lands within the Yolla Bolly Middle Eel Wilderness near Big Butte WSA.

Environmental Impacts

Impacts of the Proposed Action

Area(s) of Critical Environmental Concern – Minor, short-term impacts would occur at the immediate eradication site, however, invasive weed eradication benefits, protects and conserves the native biodiversity, water quality, riparian and wildlife habitat, and cultural resources that provide the foundation for ACEC designation.

Invasive Species – Specifically, Japanese knotweed will be removed to the point of eradication from BLM lands by the proposed protocols.

Social/Economic - Although the project would be occurring on public lands, local communities are likely to have heightened concern due to the potential involvement of herbicides. Many concerned citizens have fought to reduce and eliminate widespread herbicide use by public works departments, highway maintenance crews, and private and public forest managers. Reducing large scale herbicidal applications in Humboldt County was achieved through grassroots efforts and great public support. However, many of these same citizens have worked to restore native vegetation, fisheries, wildlife habitat and other resource values that would be impacted negatively by a knotweed infestation.

The proposed action could be divisive, where the threat posed by Japanese knotweed is not fully appreciated, or that the proposed treatment protocol is not perceived to be warranted. However, the proposed action could be unifying, as the local communities work to prevent weed growth and/or eradicate a very invasive weed that threatens treasured waterways, water quality, and riparian vegetation. Local economics could be positively affected by local groups receiving potential funds to assist with manual removal of Japanese knotweed. Continuous dialogue and outreach/education will be an important part of implementation.

People who collect vegetation, edible wild fruits or other plant parts, would not be affected by the proposed action since specific application areas will be identified. The manner of herbicide application through stem injection insures no off target exposure, and field soil bacteria rapidly break glyphosate (the active ingredient) down into carbon dioxide and a readily absorbable phosphorus food source. Glyphosate products such as RoundUp™ are commercially sold in bulk at common retail outlets such as Costco; and already used by private citizens in the watershed. Glyphosate is an unrestricted herbicide in the State of California and is considered safe to humans and animal organisms.

An independent study in 2000 by Gary Williams, Robert Kroes, and Ian C. Munro entitled “Safety Evaluation and Risk Assessment of the Herbicide Roundup and its Active Ingredient, Glyphosate, for Humans,” was published in Regulatory Toxicology and Pharmacology, Volume 31, pages 117-165 (2000), corroborating key findings of Monsanto studies that had previously been circulated around the world. These findings in summary are that; a) glyphosate is not a carcinogen, b) has a very low acute toxicity, c) children are not at greater risk, d) there is no evidence of endocrine disruption, and e) there is no synergistic adverse effect.

However, not all herbicides are created equal, and many are truly damaging to both flora and fauna, humans included. Some people may feel psychologically and emotionally affected due to a strong aversion toward chemical application near their private property or on public lands where they recreate. Clear signage near the application site will educate the public about the specifics of the application method; and herbicide metabolism by soil bacteria, and well as the plant specific pathway that the herbicide affects. Site specific education will help mitigate feelings caused by a lack of complete information. Specifically, any herbicide application would only impact Japanese Knotweed because of the stem injection system of herbicide delivery. There would be no non-target affects to other plants or vegetation. Overall the impact to both social and economic values would be positive through protection of the natural ecological systems that are important to the local rural communities in the region.

Cultural and Native American Concerns - The proposed action includes language that would protect cultural sites and/or artifacts. Applicable Native American tribes would be contacted prior to any herbicide use within their traditional territory. Cultural vegetation collection, or collection of edible wild fruits, would not be impacted by the proposed action. Specifically, any herbicide application would only impact Japanese Knotweed because of the specific and targeted application methods. Overall the impact to both social and economic values would be negligible to minor. Under any Alternative, in the event, during weed eradication, that any cultural resource is discovered, all work will stop until a qualified archaeologist evaluates the find.

Recreation – There may be impacts to a small percentage of recreation users based on concerns of encountering herbicides in a natural resource based recreation setting. Where herbicides are applied, public notice via on site postings will provide general public awareness. The use of educational signing will help balance any initial surprise

encountered by recreational users. Signing will include telephone contacts for further information.

Soils – Soil may be temporarily compacted and/or loosened via the manual excavation process of the knotweed rhizomes. The application of glyphosate to knotweed vegetation will have none or negligible short term effects to any soil type and its ability to grow vegetation. In the soil environment, glyphosate is relatively immobile due to its strong adsorption to soil particles. Glyphosate's primary route of decomposition in the environment is through microbial degradation in soil (Franz *et al.* 1997). The herbicide is inactivated and biodegraded by soil microbes at rates of degradation related to microbial activity in the soil and factors that affect this activity (Ericksson, 1975). The biological degradation process is carried out under both aerobic and anaerobic conditions by soil microflora. Rates of decomposition depend on soil and microflora population types. In nonsterile conditions, as much as 55 percent of C14-labeled glyphosate is given off as carbon dioxide within four weeks using Lintonia Sandy Loam soil (USDA 1984; Rueppel *et al.*, 1977).

A study on the effects of glyphosate on microbial biomass (Stratton G. and Stewart K. 1992) found glyphosate generally had no significant effect on the numbers of bacteria, fungi or actinomycetes in forest soil and overlying forest litter. There was no effect of glyphosate on in situ respiration in most the treated systems while the remainder showed an increase in respiration. (Muller *et al.* 1981) found that glyphosate degrades at very low temperatures and does not adversely affect nitrogen fixation, nitrification or denitrification activity.

T&E Fish - Glyphosate is absorbed almost exclusively by plant foliage and is then translocated throughout the plant by the plant's circulatory system. Once in the soil, glyphosate is broken down into natural materials by soil microflora and has little potential to move in the ground. Glyphosate is commonly applied using a polyethoxylated tallowamine surfactant which has been shown to be harmful to fish and amphibians (Relyea 2005). Under the proposed action, glyphosate will be applied in small amounts directly to the plants with developed canes without the use of a surfactant. For secondary resprouts that are treated prior to cane development, either wick or low volume foliar spray application methods will be used which require adjuvant surfactant. When utilizing these application methods, no surfactant will contact T&E fish bearing environments as direct wick application will be used closest to the water edge; and low-volume foliar spray would only be used in instances where the knotweed vegetation is far enough away from water such that there is no opportunity for incidental contact due to application drift. According to the Extension Toxicology Network (June 2006) glyphosate is practically non-toxic to fish and may be slightly toxic to aquatic invertebrates. In addition, Extension Toxicology Network (June 1996) states that there is very low potential for this compound to build up in the tissues of aquatic invertebrates or other aquatic organisms. Given the small amounts proposed for use, the low probability that glyphosate will reach the water in significant quantities, and the non-toxic nature of glyphosate to fish, no impacts are expected to T&E fish from application of glyphosate.

Even with effective erosion control measures, it is likely that some amount of sediment would be yielded to a stream channel during and after an excavation near a stream channel. The effects to listed fish would depend greatly on the proximity of the excavation to spawning and rearing habitat as well as the area and depth of the excavation. A large excavation in close proximity to spawning habitat for Pacific salmon could result in enough increase in sedimentation to result in reduced survival of incubating eggs. In addition, chronic erosion from a streamside excavation could greatly increase sedimentation, and thus reduce visibility enough, to impair fish feeding which could lead to reduced growth of juvenile fish. In most cases these effects are expected to be negligible but, in cases where the impacts are expected to be significant, the proposed action allows for not implementing manual excavation of knotweed and using glyphosate to eradicate the infestation which, as stated above, is not expected to have impacts to listed fish.

Vegetation – Limited amounts of native and naturalized vegetation may be disturbed or destroyed in the manual excavation process of the knotweed rhizomes. Short term, minor effects could occur to adjacent, non-target vegetation with the use of hollow stem herbicide treatment methods, or by applicator error in foliar application. In a recent 2006 article in the Native Plants Journal by Roberta Davenport it states; “Stem injection can injure native shrubs, such as salmonberry, that have root contact with knotweed rhizomes”. However, it’s not described in the article what the basis for this statement was. Ghassemi *et al.* (1981) found that less than one percent of the glyphosate in soil is absorbed via the roots. The Accord® label states that, it is not available for plant uptake and will not harm off-site vegetation where roots grow onto the treatment area or if the soil is transported off-site (Accord label®). Glyphosate exhibits no pre-emergent activity even when applied at high rates (Franz *et al.* 1997) and will not affect native vegetation regrowth.

Wetlands/Riparian - The proposed action would be restorative to wetland/riparian areas infested with knotweed. No negative impacts to overall wetlands/riparian resources for a given area are expected under the Proposed Action. Ideally, a small infestation will have been identified and rapidly receive treatment. Treatment sites are expected to be small, therefore only potentially disturbing a very limited area with short-term disturbance to adjacent vegetation; such as, limited trampling as a result of access to the treatment site, soil movement due to rhizome excavation, temporary side-casting of soil (during the dry season), trampling of non-target vegetation, or incidental, non-target plant mortality as a result of herbicide application. Upon completion of treatment, it is expected that any riparian/wetland site would rapidly re-vegetate and resume its full native function.

Impacts of Alternatives

Alternative 1: No invasive weed management; allow non-native plant introductions to colonize freely.

Summary Table- Alternative 1

Critical Elements of the Human Environment

The following elements of the Human environment are subject to requirements specified in statute, regulation, or executive order and must be considered in this EA.

Table 1. Critical Elements of the Human environment that have been considered for this environmental assessment (EA) are listed below. Elements that are unique to the alternative and/or vary from an element in the Proposed Action table, and may be affected are further described in this EA. Rationale for those elements that will not be affected are listed in this table.				
Critical Element	No Impact	May Impact	Not Present	Rationale
Areas of Critical Environmental Concern		X		
Cultural Resources		X		
Invasive, Nonnative Weed Species		X		
Native American Religious Concerns		X		
T&E Fish		X		
Water Quality: surface/ground		X		
Wetlands/Riparian		X		
Wild & Scenic Rivers		X		
Wilderness/Wilderness Study Areas		X		

Area's of Critical Environmental Concern - Lack of invasive weed eradication could cause significant impacts to the relevant and important resource values that led to the areas' designation as ACECs. For example, Japanese knotweed could cause a serious displacement of biodiversity and wildlife habitat along water courses, as well as a decline in water quality. There could be increased sedimentation of rivers or estuaries due to increased erosion along the banks of any given river.

Cultural and Native American Concerns - Under Alternative 1, no direct impacts would occur since no weeds would be removed. There would still be impacts by infestations taking over potential traditional collection areas, etc.

Invasive Species – Invasive species would increase under Alternative 1. This would lead to impacts of all other affected resources.

Aquatic Habitats, Essential Fish Habitat, T&E Fish Species – Under Alternative 1, Japanese knotweed infestations would increase to the point that they would eventually seriously degrade aquatic environments and the species that depend on them. Knotweed infestations would lead to increased bank destabilization issues, increase sedimentation to

water quality, and reductions in native floral and faunal diversity in various reaches of water courses, potentially impacting T&E Fish species habitat and rearing needs.

T&E Fish – Since knotweed can displace native riparian vegetation, infestations of knotweed could negatively impact fish habitat, depending on the size of the infestation, by displacing riparian tree species necessary for proper stream function and shading. When the knotweed is dormant during the winter months infested riparian areas would be susceptible to the erosive forces of high winter streamflows which would allow for bank erosion and thus increased sedimentation which could negatively impact spawning success of listed Pacific salmon species.

Social/Economic - Under Alternative 1, the local community would not have to tolerate or participate in any manual eradication efforts. The public would not have to analyze or accept the very specific, limited use of herbicide in their home region; however, they would be impacted by the spread of an invasive weed and disruption of natural ecosystems on regional rivers, waterways, and roadsides that would occur over time. There would be no economic benefit from federal dollars assisting in the removal of this invasive pest; and there might even eventually be a loss of limited ecotourism dollars due a decline of riparian or other habitat conditions. Further, under Alternative 1, there would be a loss of a public outreach/education opportunity that could help prevent, control, and eradicate new and existing infestations; and the issue of invasive weeds as a whole.

Recreation – Under Alternative 1, and over the long term, if infestations are left to colonize freely in certain areas, they could potentially have a large impact on recreation users. For example, with large scale infestation along the bank of navigable water course, native bank vegetation and associated floral and fauna diversity would be seriously displaced; potentially affecting aquatic floral and fauna communities as well. Recreational users expecting certain resource characteristics could be disappointed. Also, there could be recreational and visual impacts that might purvey a general sense of poor stewardship by the BLM to the public.

Vegetation - Vegetation would not be directly impacted by Alternative 1. However, vegetation would be negatively impacted, over a given period of time, by the inevitable displacement caused by untreated Japanese knotweed.

Water Quality – Under Alternative 1, water quality could decline in riparian settings where water flows freely. Japanese knotweed grows erect canes with tall leafy vegetation that shades out all other vegetation during the growing season. These canes die back in the winter, leaving riparian banks unprotected from erosion. Increased sedimentation to the water course is a likely scenario.

Wetlands/Riparian – Under Alternative 1, native wetland and riparian conditions would become displaced and the system would become non-functional.

Wild and Scenic Rivers – While currently there are no reports of any designated Wild and Scenic Rivers being infected with Japanese knotweed; there could be infections in the future. Under Alternative 1, untreated Japanese knotweed infestations could spread to the point that “outstandingly, remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values” are seriously altered.

Wilderness/Wilderness Study Area(s) - The Wilderness Act defines wilderness as “an area where the earth and its community of life are untrammeled by man, where man himself is a visitor who does not remain.” The Act further goes on to define wilderness as “an area of undeveloped federal land retaining its primeval character and influence, without permanent improvements or human habitation.” In a wilderness study area, it is likely that a large infestation of Japanese knotweed would impact the ‘community of life’ it infested. Further, the infestation would alter the ‘primeval character and influence’. In general, invasive weed introduction and spread is a direct and indirect artifact of human activity and disturbance; and to many people that are cognizant of this fact, see invasive weeds as a form of biological pollution.

Alternative 2: Manual/Mechanical Methods only, no herbicide use (existing management; technically the no action alternative).

Summary Table- Alternative 2

Critical Elements of the Human Environment

The following elements of the Human environment are subject to requirements specified in statute, regulation, or executive order and must be considered in this EA.

Table 1. Critical Elements of the Human environment that have been considered for this environmental assessment (EA) are listed below. Elements that are unique to the alternative and/or vary from an element in the Proposed Action table, and may be affected are further described in this EA. Rationale for those elements that will not be affected are listed in this table.				
Critical Element	No Impact	May Impact	Not Present	Rationale
Areas of Critical Environmental Concern		X		
Cultural Resources		X		
Invasive, Nonnative Weed Species		X		
Native American Religious Concerns		X		
T&E Fish		X		
Water Quality: surface/ground		X		
Wetlands/Riparian		X		
Wild & Scenic Rivers		X		
Wilderness/Wilderness Study Areas		X		

Area(s) of Critical Environmental Concern - Invasive weed eradication benefits, protects and conserves the native biodiversity, water quality, riparian and wildlife habitat, and cultural resources that provide the foundation for ACEC designation. However, invasive weed infestations may not be completely eradicated under Alternative 2, but rather contained. This extends the window of risk of spread to other areas within an infected ACEC potentially creating additional project treatment sites.

Cultural and Native American Concerns - Under any Alternative, in the event, during weed eradication, that any cultural resource is discovered, all work will stop until a qualified archaeologist evaluates the find.

Invasive Species – Invasive species could be contained under Alternative 2, and perhaps eradicated, depending on many specific site characteristics that would make complete eradication possible. However, the time it takes to reach eradication might be longer than through the integrated approach, leaving a small degree of risk in terms of a longer window of opportunity for accidental or unintended spread from the containment site.

Social/Economic - Social values could be affected positively or negatively through community networking. Alternative 2 could be divisive, where the threat posed by Japanese knotweed is not fully understood or appreciated, and the seemingly endless manual labor and associated expenses might seem to be overly costly and wasteful of government funds. Some community members might think that herbicides would be the more expedient and cost effective way to resolve the ecological threat. On the other hand, alternative 2 might reinforce a community's values to stay organic, and galvanize that spirit through communal hard work. However, some sites will likely be impossible to remove through manual means, and herbicide use will be the only method left. If after lots of hard manual work the BLM leaves some knotweed in an infested project site due to the sensitivity of some over the concept of herbicide use; the knotweed will spread; creating watershed havoc. The community will not benefit from the problem not being resolved. If Alternative 2 is selected there is risk of not completely eradicating the infestation through slower manual means alone; and, during that treatment time, the knotweed could infect other areas. Local community economics could be positively affected by local groups receiving potential funds to assist with manual removal of Japanese knotweed. Overall, the impact to both social and economic values would be minor to major depending on whether or not the infestation is controlled.

Soils – Soil may be temporarily compacted and/or loosened via the manual excavation process of the knotweed rhizomes.

Vegetation - Limited amounts of native and naturalized vegetation may be disturbed or destroyed in the manual excavation process of the knotweed rhizomes. After knotweed eradication efforts, this vegetation is expected to recolonize wherever the knotweed had been successfully removed.

T&E Fish - Even with effective erosion control measures, it is likely that some amount of sediment would be yielded to a stream channel during and after an excavation near a

stream channel. The effects to listed fish would depend greatly on the proximity of the excavation to spawning and rearing habitat as well as the area and depth of the excavation. A large excavation in close proximity to spawning habitat for Pacific salmon could result in enough increase in sedimentation to result in reduced survival of incubating eggs. In addition, chronic erosion from a streamside excavation could greatly increase sedimentation, and thus reduce visibility enough, to impair fish feeding which could lead to reduced growth of juvenile fish. In most cases, however the effects are expected to be negligible.

Water Quality – Under Alternative 2, even with erosion control measures in place, there could be increased sedimentation to water courses as a result of manual/mechanical excavation of a given site during rainfall events. The amount of sediment produced depends on the area and depth of the excavation but in most cases it would likely be negligible.

Wetland/Riparian – Under Alternative 2, there could be some chronic erosion spots that could develop along infected stream banks as a result of knotweed that can't be successfully eradicated with manual removal alone. Manual methods could eradicate the more terrestrial areas of an infestation; but where the infestation became too aquatically influenced, manual removal may become infeasible. For other infestations that are mainly terrestrial and free flowing water or water table is not a problem, manual eradication could eliminate the whole infestation. In those cases, treatment disturbance could persist for several years; which may contribute to some sediment transport. Alternative 2 disturbances would include soil movement from rhizome excavation, temporary side-casting of soil, and trampling of non-target vegetation. Upon completion of treatment, it is expected that any riparian/wetland site would rapidly revegetate and resume its full native function.

Wilderness/Wilderness Study Area(s) - While there are no Wilderness/Wilderness Study Area(s) that are currently infected with Japanese knotweed, there could be at some time in the future. Rapid response and treatment of a habitat altering invasive weed will not impact the Wilderness/Wilderness Study Area(s) values, but rather, will help preserve its character which led to its designation in the first place. However, under Alternative 2, there is some risk that possibly all of a given infestation may not be able to be removed if it is too aquatically influenced. Rhizomes submerged in water, or rooted in the water table, may not manually be able to be dug out. At best, an infestation like this would be maintained, but not eradicated. Therefore, there is a chance under Alternative 2 that at some time in the future; Japanese knotweed may ultimately spread, thus impacting a given Wilderness/Wilderness Study Area(s).

The Wilderness Act defines wilderness as “an area where the earth and its community of life are untrammelled by man, where man himself is a visitor who does not remain.” The Act further goes on to define wilderness as “an area of undeveloped federal land retaining its primeval character and influence, without permanent improvements or human habitation.” In a wilderness study area, it is likely that a large infestation of Japanese knotweed would impact the ‘community of life’ it infested. Further, the infestation

would alter the ‘primeval character and influence’. In general, invasive weed introduction and spread is a direct and indirect artifact of human activity and disturbance; and many people view invasive weeds as a form of biological pollution.

Wild and Scenic Rivers - While there are no Wild and Scenic Rivers that are currently infected with Japanese knotweed, there could be at some time in the future. Rapid response and treatment of a potentially river altering invasive weed will not impact the Wild and Scenic river, but rather, will help preserve its character which led to its designation in the first place. However, under Alternative 2, there is risk that possibly all of a given infestation may not be able to be removed. Rhizomes submerged in water, or rooted in the water table, may not manually be able to be dug out. At best, the infestation would be maintained, but not eradicated. Therefore, there is a chance, that at some time in the future, Japanese knotweed may ultimately spread, thus impacting a Wild and Scenic River and the values that led to its designation as such.

Mitigating Measures

Practices and procedures designed to keep impacts to a minimum, and safety to a maximum have been incorporated into the proposed action.

Cumulative Impacts

Proposed Action

Cumulative impacts of BLM implementation of the Proposed Action are expected to be negligible. Glyphosate products such as RoundUp™ are readily available and commercially sold in bulk at common local retail outlets such as Costco, nurseries, and convenience stores; BLM’s prudent and specific use, in comparison, is minimal. Glyphosate is an unrestricted herbicide in the State of California and is considered safe to humans and animal organisms. Application of glyphosate is expected to breakdown naturally to completely undetectable levels within about 3 months of application. Soil bacteria will consume the active ingredient as food; and greater than 70% of the product will be converted and released as carbon dioxide.

Potential soil disturbance due to manual extrication of knotweed species adjacent to or bordering rivers or streams could ultimately contribute minor amounts of sediment to a given river course. Given the relatively good condition of most watersheds in BLM ownership, and the ongoing maintenance and improvement to sediment source by BLM in the form of culvert replacements, road repair, forest stand improvement projects, etc., any short-term contributions of sediment that weed eradication efforts might make would likely have no impact.

Alternative 1

If Alternative 1 was implemented, there would be cumulative impacts to the integrity of California's natural botanical heritage. Allowing the proliferation of invasive, non-native species causes displacement of native species and their associated roles or functions in a variety of native ecosystems. Native plant species often provide for coevolved, native insects, birds, and other wildlife, by providing food, shelter, breeding, or other important functions. Often invasive species reduce the resiliency of native habitats from disturbance, which then leads to chronic downward trends in habitat quality. One by one invasive species spread, and cumulatively, this can add up to a tremendous and exponentially large impact on an entire ecosystem web.

Wilcove *et al.*, surveyed recovery plans for species listed under the United States Endangered Species Act and categorized the threats they identified into one of five categories: habitat degradation/loss, alien species, pollution, overexploitation, and disease. Table 2, below, shows the percentage of listed species for which each of these five factors was mentioned as a cause contributing to endangerment.

Table 2: Causes of endangerment mentioned in species recovery plans.

	All	Vertebrates	Invertebrates	Plants
Cause	(n = 1880)	(n = 421)	(n = 331)	(n = 1005)
Habitat degradation	85%	92%	87%	81%
Alien species	49%	47%	27%	57%
Pollution	24%	46%	45%	7%
Overexploitation	17%	27%	23%	10%
Disease	3%	11%	0%	1%

In short, invasive, non-native or “alien” species were described as the direct causative agent of native plant endangerment 57% of the time in species recovery plans studied. It is unknown to what extent those alien species played a role in the habitat degradation that was also blamed as a causative agent of species endangerment. It appears that many species are going extinct for reasons introduced or induced by modern human civilization. Therefore, it seems plausible that if the introduced and invasive Japanese knotweed in the Mattole River was left to follow its natural invasive course of spread; there might very well be some local pressures upon common native species and over time, could lead to some level of extirpation.

Alternative 2

Potential soil disturbance due to manual extrication of knotweed species adjacent to or bordering rivers or streams could ultimately contribute minor amounts of sediment to a given river course. Given the relatively good condition of most watersheds in BLM ownership, and the ongoing maintenance and improvement to sediment source by BLM in the form of culvert replacements, road repair, forest stand improvement projects, etc., any short-term contributions of sediment that weed eradication efforts might make would likely have no impact.

Consultation and Coordination

On June 1, 2006, the BLM met with the Mattole Restoration Council (MRC), representatives from Humboldt County and Pacific Lumber, as well as concerned community members to discuss the Mattole River Japanese Knotweed infestation; plant ecology, biology, and methods of control and eradication. A considerable time was spent discussing the applicability of herbicide use for eradication of this weed. The use of Aquamaster™ specifically was described as the herbicide of choice that the BLM would use on its lands should the BLM not be able to eradicate it through manual use alone. There was concurrence from members of the group present that Aquamaster™ (glyphosate) was the least toxic of all herbicides; although safety concerns remain inherent. In general, the group appreciated the situation and the threat to their river and its water quality; the river's inhabitants that could be affected, as well as the riparian forest on the banks that could be degraded. The group agreed that the method of herbicide application through stem injection was the most selective and relatively safe that they had heard of; but still remained wary and reticent to use herbicides. The group did not reject MRC's verbal announcement to try eradication of at least two of the worst infestation sites on an experimental basis. Community members asked the MRC to clearly post warnings to hikers/swimmers for their benefit and safety as well as to conduct water quality monitoring for the purpose of picking up any trace chemicals in the river itself; at which point; the community would re-evaluate the project and its risks and benefits.

Persons and Agencies Consulted

BLM Salem District, Botanist, Clare Hibler
Californians for Alternatives to Toxics, Rosemary Georgeson
California Department of Pesticide Regulation, Mack Decato
CSO Bureau of Land Management, Dianna Brink,
Dow AgroSciences representative, Beau Miller
Humboldt-Del Norte County Weed Management Area
Mattole Restoration Council, Chris Larson
Oregon/Washington Japanese Knotweed Working Group, Doug Kruezer
Petrolia Valley Residents at June 1st, Japanese Knotweed working group meeting
Redwood National Park, Andrea Williams, Stassia Samuels

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Finding Of No Significant Impact/Decision Record

Having reviewed EA#CA330-06-07 Japanese Knotweed Control Protocol: Arcata Field Office, including the explanation and resolution of any potentially significant environmental impacts, the BLM has determined that the Proposed Action will not have any significant impacts on the human environment and that an EIS is not required. The proposed action is also in conformance with the approved land use plan(s). It is the BLM's decision to implement the project.

Authorized Official: _____ Date: ____/____/____

ATTENTION:

This specimen label is provided for general information only.

- This pesticide product may not yet be available or approved for sale or use in your area.
- It is your responsibility to follow all federal, state and local laws and regulations regarding the use of pesticides.
- Before using any pesticide, be sure the intended use is approved in your state or locality.
- Your state or locality may require additional precautions and instructions for use of this product that are not included here.
- Monsanto does not guarantee the completeness or accuracy of this specimen label. The information found in this label may differ from the information found on the product label. You must have the EPA approved labeling with you at the time of use and must read and follow all label directions.
- You should not base any use of a similar product on the precautions, instructions for use or other information you find here.
- Always follow the precautions and instructions for use on the label of the pesticide you are using.

21195E2-25



Complete Directions for Use in Aquatic and Other Non-Crop Sites.

EPA Reg. No. 524-343

AVOID CONTACT OF HERBICIDE WITH FOLIAGE, GREEN STEMS, EXPOSED NON-WOODY ROOTS OR FRUIT OF CROPS, DESIRABLE PLANTS AND TREES, BECAUSE SEVERE INJURY OR DESTRUCTION MAY RESULT.

2005-1

Read the entire label before using this product.

Use only according to label instructions.

Not all products recommended on this label are registered for use in California. Check the registration status of each product in California before using.

Read the "LIMIT OF WARRANTY AND LIABILITY" statement at the end of the label before buying or using. If terms are not acceptable, return at once unopened.

THIS IS AN END-USE PRODUCT. MONSANTO DOES NOT INTEND AND HAS NOT REGISTERED IT FOR REFORMULATION. SEE INDIVIDUAL CONTAINER LABEL FOR REPACKAGING LIMITATIONS.

1.0 INGREDIENTS

ACTIVE INGREDIENT:

*Glyphosate, N-(phosphonomethyl)glycine,
in the form of its isopropylamine salt 53.8%
OTHER INGREDIENTS: 46.2%
100.0%

*Contains 648 grams per liter or 5.4 pounds per U.S. gallon of the active ingredient glyphosate, in the form of its isopropylamine salt. Equivalent to 480 grams per liter or 4.0 pounds per U.S. gallon of the acid, glyphosate.

No license granted under any non-U.S. patent(s).

2.0 IMPORTANT PHONE NUMBERS

1. FOR PRODUCT INFORMATION OR ASSISTANCE IN USING THIS PRODUCT, CALL TOLL-FREE,
1-800-332-3111.
2. IN CASE OF AN EMERGENCY INVOLVING THIS PRODUCT, OR FOR MEDICAL ASSISTANCE, CALL COLLECT, DAY OR NIGHT,
(314)-694-4000.

3.0 PRECAUTIONARY STATEMENTS

3.1 Hazards to Humans and Domestic Animals

Keep out of reach of children.

CAUTION!

Remove contaminated clothing and wash clothing before reuse. Wash thoroughly with soap and water after handling.

3.2 Environmental Hazards

Do not contaminate water when cleaning equipment or disposing of equipment washwaters. Treatment of aquatic weeds can result in oxygen depletion or loss due to decomposition of dead plants. This oxygen loss can cause fish suffocation.

In case of: SPILL or LEAK, soak up and remove to a landfill.

3.3 Physical or Chemical Hazards

Spray solutions of this product should be mixed, stored and applied using only stainless steel, aluminum, fiberglass, plastic or plastic-lined steel containers.

DO NOT MIX, STORE OR APPLY THIS PRODUCT OR SPRAY SOLUTIONS OF THIS PRODUCT IN GALVANIZED STEEL OR UNLINED STEEL (EXCEPT STAINLESS STEEL) CONTAINERS OR SPRAY TANKS. This product or spray solutions of this product react with such containers and tanks to produce hydrogen gas which may form a highly combustible gas mixture. This gas mixture could flash or explode, causing serious personal injury, if ignited by open flame, spark, welder's torch, lighted cigarette or other ignition source.

DIRECTIONS FOR USE

It is a violation of Federal law to use this product in any manner inconsistent with its labeling. This product can only be used in accordance with the Directions for Use on this label or in separately published Monsanto Supplemental Labeling. For any requirements specific to your State or Tribe, consult the agency responsible for pesticide regulations.

4.0 STORAGE AND DISPOSAL

Do not contaminate water, foodstuffs, feed or seed by storage or disposal. Keep container closed to prevent spills and contamination.

PESTICIDE STORAGE: STORE ABOVE 5°F (-15°C) TO KEEP PRODUCT FROM CRYSTALLIZING. Crystals will settle to the bottom. If allowed to crystallize, place in a warm room 68°F (20°C) for several days to redissolve and roll or shake container or recirculate in mini-bulk containers to mix well before using.

PESTICIDE DISPOSAL: Wastes resulting from the use of this product that cannot be used or chemically reprocessed should be disposed of in a landfill approved for pesticide disposal or in accordance with applicable Federal, state, or local procedures.

CONTAINER DISPOSAL: Emptied container retains vapor and product residue. Observe all labeled safeguards until container is cleaned, reconditioned, or destroyed.

See container label for STORAGE AND DISPOSAL instructions.

5.0 GENERAL INFORMATION

(How this product works)

Product Description: This product is a postemergent, systemic herbicide with no soil residual activity. It gives broad-spectrum control of many annual weeds, perennial weeds, woody brush and trees.

Time to Symptoms: This product moves through the plant from the point of foliage contact to and into the root system. Visible effects on most annual weeds occur within 2 to 4 days, but on most perennial weeds may not occur for 7 days or more. Extremely cool or cloudy weather following treatment may slow activity of this product and delay development of visual symptoms. Visible effects are a gradual wilting and yellowing of the plant which advances to complete browning of above-ground growth and deterioration of underground plant parts.

Mode of Action in Plants: The active ingredient in this product inhibits an enzyme found only in plants and microorganisms that is essential to formation of specific amino acids.

Cultural Considerations: Reduced control may result when applications are made to annual or perennial weeds that have been mowed, grazed or cut, and have not been allowed to regrow to the recommended stage for treatment.

Rainfastness: Heavy rainfall soon after application may wash this product off of the foliage and a repeat application may be required for adequate control.

No Soil Activity: Weeds must be emerged at the time of application to be controlled by this product. Weeds germinating from seed after application will not be controlled. Unemerged plants arising from unattached underground rhizomes or rootstocks of perennials will not be affected by the herbicide and will continue to grow.

Tank Mixing: This product does not provide residual weed control. For subsequent residual weed control, follow a label-approved herbicide program. Read and carefully observe the cautionary statements and all other information appearing on the labels of all herbicides used. Use according to the most restrictive label directions for each product in the mixture.

When this label recommends a tank mixture with a generic active ingredient such as diuron, 2,4-D or dicamba, the user is responsible for ensuring that the mixture product's label allows the specific application.

Buyer and all users are responsible for all loss or damage in connection with the use or handling of mixtures of this product with herbicides or other materials that are not expressly recommended in this label. Mixing this product with herbicides or other materials not recommended on this label may result in reduced performance.

Annual Maximum Use Rate: The combined total of all treatments must not exceed 8 quarts of this product per acre per year in terrestrial sites. The maximum application rate of 7.5 pints per acre must not be exceeded in any single broadcast application that is being made over water. The maximum use rates stated throughout this product's labeling apply to this product combined with the use of all other herbicides containing glyphosate or sulfosate as the active ingredient, whether applied as mixtures or separately. Calculate the application rates and ensure that the total use of this and other glyphosate or sulfosate containing products does not exceed stated maximum use rates.

ATTENTION

AVOID CONTACT OF HERBICIDE WITH FOLIAGE, GREEN STEMS, EXPOSED NON-WOODY ROOTS OR FRUIT OF CROPS, DESIRABLE PLANTS AND TREES, BECAUSE SEVERE INJURY OR DESTRUCTION MAY RESULT.

AVOID DRIFT. EXTREME CARE MUST BE USED WHEN APPLYING THIS PRODUCT TO PREVENT INJURY TO DESIRABLE PLANTS AND CROPS.

Do not allow the herbicide solution to mist, drip, drift or splash onto desirable vegetation since minute quantities of this product can cause severe damage or destruction to the crop, plants or other areas on which treatment was not intended. The likelihood of injury occurring from the use of this product increases when winds are gusty, as wind velocity increases, when wind direction is constantly changing or when there are other meteorological conditions that favor spray drift. When spraying, avoid combinations of pressure and nozzle type that will result in splatter or fine particles (mist) that are likely to drift. AVOID APPLYING AT EXCESSIVE SPEED OR PRESSURE.

NOTE: Use of this product in any manner not consistent with this label may result in injury to persons, animals or crops, or other unintended consequences.

6.0 MIXING

Clean sprayer parts immediately after using this product by thoroughly flushing with water.

NOTE: REDUCED RESULTS MAY OCCUR IF WATER CONTAINING SOIL IS USED, SUCH AS VISIBLY MUDDY WATER OR WATER FROM PONDS AND DITCHES THAT IS NOT CLEAR.

6.1 Mixing with Water

This product mixes readily with water. Mix spray solutions of this product as follows: Fill the mixing or spray tank with the required amount of water. Add the recommended amount of this product near the end of the filling process and mix well. Use caution to avoid siphoning back into the carrier source. Use approved anti-back-siphoning devices where required by state or local regulations. During mixing and application, foaming of the spray solution may occur. To prevent or minimize foam, avoid the use of mechanical agitators, terminate by-pass and return lines at the bottom of the tank and, if needed, use an approved anti-foam or defoaming agent.

6.2 Surfactant

This product requires the use of a nonionic surfactant. When using this product, mix 2 or more quarts of a nonionic surfactant per 100 gallons of spray solution. Examples of when to use the higher surfactant rate include, but are not limited to: high water volumes, adverse environmental conditions, tough to control weeds, weeds under stress, surfactants with less than 70 percent active ingredient, tank mixes, etc. These surfactants should not be used in excess of 1 quart per acre when making broadcast applications.

Always read and follow the manufacturer's surfactant label recommendations for best results. Carefully observe all cautionary statements and other information appearing in the surfactant label.

When applied as recommended under the conditions described, this product controls annual and perennial weeds listed in the label booklet. Do not reduce rates of this product when adding surfactant.

DO NOT add buffering agents or pH adjusting agents to the spray solution when AquaMaster herbicide is the only pesticide used.

6.3 Tank Mixing Procedure

Mix labeled tank mixtures of this product with water as follows:

1. Place a 20- to 35-mesh screen or wetting basket over filling port.
2. Through the screen, fill the spray tank one-half full with water and start agitation.
3. If a wettable powder is used, make a slurry with the water carrier, and add it SLOWLY through the screen into the tank. Continue agitation.
4. If a flowable formulation is used, premix one part flowable with one part water. Add diluted mixture SLOWLY through the screen into the tank. Continue agitation.
5. If an emulsifiable concentrate formulation is used, premix one part emulsifiable concentrate with two parts water. Add diluted mixture slowly through the screen into the tank. Continue agitation.
6. Continue filling the spray tank with water and add the required amount of this product near the end of the filling process.
7. Add nonionic surfactant to the spray tank before completing the filling process.
8. Add individual formulations to the spray tank as follows: wettable powder, flowable, emulsifiable concentrate, drift control additive, water soluble liquid and nonionic surfactant.

Maintain good agitation at all times until the contents of the tank are sprayed. If the spray mixture is allowed to settle, thorough agitation is required to resuspend the mixture before spraying is resumed.

Keep by-pass line on or near the bottom of the tank to minimize foaming. Screen size in nozzle or line strainers should be no finer than 50-mesh.

Always predetermine the compatibility of labeled tank mixtures of this product with water carrier by mixing small proportional quantities in advance. Ensure that the specific tank mixture product is registered for application at the desired site.

Refer to the "TANK MIXING" section of "GENERAL INFORMATION" for additional precautions.

6.4 Mixing Percent Solutions

Prepare the desired volume of spray solution by mixing the amount of this product in water as shown in the following table:

Spray Solution

Desired Volume	AMOUNT OF AQUAMASTER					
	0.5%	0.75%	1%	1.5%	4%	8%
1 Gal	0.7 oz.	1 oz.	1.3 oz	2.0 oz.	5 oz.	10 oz.
25 Gal	1.0 pt.	1.5 pt.	1.0 qt.	1.5 qt.	4 qt.	2 gal.
100 Gal	2.0 qt.	3 qt.	1.0 gal.	1.5 gal.	4 gal.	8 gal.
2 tablespoons = 1 fluid ounce						

For use in backpack, knapsack or pump-up sprayers, it is suggested that the recommended amount of this product be mixed with water in a larger container. Fill sprayer with the mixed solution.

6.5 Colorants or Dyes

Agriculturally approved colorants or marking dyes may be added to this product. Colorants or dyes used in spray solutions of this product may reduce performance, especially at lower rates or dilution. Use colorants or dyes according to the manufacturer's recommendations.

6.6 Drift Reduction Additives

Drift reduction additives may be used with all equipment types, except wiper applicators, sponge bars and Controlled Droplet Applicator (CDA) equipment. When a drift reduction additive is used, read and carefully observe the cautionary statements and all other information appearing on the additive label. The use of drift reduction additives can affect spray coverage which may result in reduced performance.

7.0 APPLICATION EQUIPMENT AND TECHNIQUES

Do not apply this product through any type of irrigation system.

APPLY THESE SPRAY SOLUTIONS IN PROPERLY MAINTAINED AND CALIBRATED EQUIPMENT CAPABLE OF DELIVERING DESIRED VOLUMES.

SPRAY DRIFT MANAGEMENT

AVOID DRIFT. EXTREME CARE MUST BE USED WHEN APPLYING THIS PRODUCT TO PREVENT INJURY TO DESIRABLE PLANTS AND CROPS.

Do not allow the herbicide solution to mist, drip, drift or splash onto desirable vegetation since minute quantities of this product can cause severe damage or destruction to the crop, plants or other areas on which treatment was not intended.

Avoiding spray drift at the application site is the responsibility of the applicator. The interaction of many equipment- and weather-related factors determine the potential for spray drift. The applicator and the grower are responsible for considering all these factors when making decisions.

7.1 Aerial Equipment

DO NOT APPLY THIS PRODUCT USING AERIAL SPRAY EQUIPMENT EXCEPT UNDER CONDITIONS AS SPECIFIED WITHIN THIS LABEL.

FOR AERIAL APPLICATION IN CALIFORNIA, REFER TO THE FEDERAL SUPPLEMENTAL LABEL FOR AERIAL APPLICATIONS IN THAT STATE FOR SPECIFIC INSTRUCTIONS, RESTRICTIONS AND REQUIREMENTS.

This product plus Oust, 2,4-D or dicamba tank mixtures may not be applied by air in California.

TO PREVENT INJURY TO ADJACENT DESIRABLE VEGETATION, APPROPRIATE BUFFER ZONES MUST BE MAINTAINED.

Use the recommended rates of this herbicide in 3 to 25 gallons of water per acre.

Ensure uniform application—To avoid streaked, uneven or overlapped application, use appropriate marking devices.

AERIAL SPRAY DRIFT MANAGEMENT

The following drift management requirements must be followed to avoid off-target drift movement from aerial applications to agricultural field crops. These requirements do not apply to public health uses.

1. The distance of the outermost nozzles on the boom must not exceed 3/4 the length of the wingspan or rotor.
2. Nozzles must always point backward parallel with the air stream and never be pointed downwards more than 45 degrees. Where states have more stringent regulations, they should be observed.

Importance of Droplet Size

The most effective way to reduce drift potential is to apply large droplets. The best drift management strategy is to apply the largest droplets that provide sufficient coverage and control. Applying larger droplets reduces drift potential, but will not prevent drift if applications are made improperly, or under unfavorable environmental conditions (see the "Wind", "Temperature and Humidity", and "Temperature Inversions" sections of this label).

Controlling Droplet Size

- **Volume:** Use high flow rate nozzles to apply the highest practical spray volume. Nozzles with the higher rated flows produce larger droplets.
- **Pressure:** Use the lower spray pressures recommended for the nozzle. Higher pressure reduces droplet size and does not improve canopy penetration. When higher flow rates are needed, use higher flow rate nozzles instead of increasing pressure.

- **Number of Nozzles:** Use the minimum number of nozzles that provide uniform coverage.

- **Nozzle Orientation:** Orienting nozzles so that the spray is released backwards, parallel to the air stream, will produce larger droplets than other orientations. Significant deflection from the horizontal will reduce droplet size and increase drift potential.

- **Nozzle Type:** Use a nozzle type that is designed for the intended application. With most nozzle types, narrower spray angles produce larger droplets. Consider using low-drift nozzles. Solid stream nozzles oriented straight back produce larger droplets than other nozzle types.

- **Boom Length:** For some use patterns, reducing the effective boom length to less than 3/4 of the wingspan or rotor length may further reduce drift without reducing swath width.

- **Application Height:** Applications should not be made at a height greater than 10 feet above the top of the largest plants unless a greater height is required for aircraft safety. Making applications at the lowest height that is safe reduces the exposure of the droplets to evaporation and wind.

Swath Adjustment

When applications are made with a crosswind, the swath will be displaced downwind. Therefore, on the up and downwind edges of the field, the applicator must compensate for this displacement by adjusting the path of the aircraft upwind. Swath adjustment distance should increase, with increasing drift potential (higher wind, smaller droplets, etc.).

Wind

Drift potential is lowest between wind speeds of 2 to 10 miles per hour. However, many factors, including droplet size and equipment type determine drift potential at any given speed. Application should be avoided below 2 miles per hour due to variable wind direction and high inversion potential. **NOTE:** Local terrain can influence wind patterns. Every applicator should be familiar with local wind patterns and how they affect drift.

Temperature and Humidity

When making applications in low relative humidity, set up equipment to produce larger droplets to compensate for evaporation. Droplet evaporation is most severe when conditions are both hot and dry.

Temperature Inversions

Applications should not occur during a temperature inversion because drift potential is high. Temperature inversions restrict vertical air mixing, which causes small suspended droplets to remain in a concentrated cloud. This cloud can move in unpredictable directions due to the light variable winds common during inversions. Temperature inversions are characterized by increasing temperatures with altitude and are common on nights with limited cloud cover and light to no wind. They begin to form as the sun sets and often continue into the morning. Their presence can be indicated by ground fog; however, if fog is not present, inversions can also be identified by the movement of smoke from a ground source or an aircraft smoke generator. Smoke that layers and moves laterally in a concentrated cloud (under low wind conditions) indicates an inversion, while smoke that moves upward and rapidly dissipates indicates good vertical air mixing.

Sensitive Areas

This product should only be applied when the potential for drift to adjacent sensitive areas (e.g., residential areas, bodies of water, known habitat for threatened or endangered species, non-target crops) is minimal (e.g., when wind is blowing away from the sensitive areas).

Aircraft Maintenance

PROLONGED EXPOSURE OF THIS PRODUCT TO UNCOATED STEEL SURFACES MAY RESULT IN CORROSION AND POSSIBLE FAILURE OF THE PART. The maintenance of an organic coating (paint) which meets aerospace specification MIL-C-38413 may prevent corrosion. To prevent corrosion of exposed parts, thoroughly wash aircraft after each day of spraying to remove residues of this product accumulated during spraying or from spills. Landing gear is most susceptible.

7.2 Ground Broadcast Equipment

For broadcast ground applications, unless otherwise specified use this product at the rate of 1.5 to 3 pints per acre for annual weeds, 3 to 7.5 pints per acre for perennial weeds and 3 to 7.5 quarts per acre for woody brush and trees. When used according to label directions this product will give control or partial control of herbaceous weeds, woody brush and trees listed in the "WEEDS CONTROLLED" section of this label.

Use the recommended rates of this product in 3 to 40 gallons of water per acre as a broadcast spray unless otherwise specified. As density of weeds increases, spray volume should be increased within the recommended range to ensure complete coverage. Carefully select proper nozzles to avoid spraying a fine mist. For best results with ground application equipment, use flat-fan nozzles. Check for even distribution of spray droplets.

7.3 Hand-Held Equipment

Apply to foliage of vegetation to be controlled. For applications made on a spray-to-wet basis, spray coverage should be uniform and complete. Do not spray to the point of runoff. Use coarse sprays only.

For control of weeds listed in the "ANNUAL WEEDS" section of "WEEDS CONTROLLED", apply a 0.5-percent solution of this product to weeds less than 6 inches in height or runner length. For annual weeds over 6 inches tall, or unless otherwise specified, use a 1-percent solution. Apply prior to seedhead formation in grass or bud formation in broadleaf weeds.

For best results, use a 1.5-percent solution on harder-to-control perennials, woody vines, brush and trees. Make applications to perennials after seedhead emergence in grasses or bud formation in broadleaf weeds, woody brush and trees for best results.

For low-volume directed spray applications, use a 4- to 8-percent solution of this product for control or partial control of annual weeds, perennial weeds, or woody brush and trees. Spray coverage should be uniform with at least 50 to 75 percent of the foliage contacted. Coverage of the top one half of the plant is important for best results. If a straight stream nozzle is used, start the application at the top of the targeted vegetation and spray from top to bottom in a lateral zig-zag motion. For flat-fan and cone nozzles and with hand-directed mist blowers, mist the application over the foliage of the targeted vegetation. To ensure adequate spray coverage, spray both sides of large or tall woody brush and trees, when foliage is thick and dense, or where there are multiple sprouts. For best results, apply to actively growing woody brush and trees after full leaf expansion and before fall color and leaf drop.

Unless otherwise specified, use the recommended rates listed in the following "APPLICATION RATES" table for various methods of foliar application using high-volume, backpack, knapsack and similar types of hand-held equipment. When used according to label directions this product will give control or partial control of herbaceous weeds, woody brush and trees listed in the "WEEDS CONTROLLED" section of this label.

APPLICATION RATES

APPLICATION	AQUAMASTER	SPRAY VOLUME GALLONS/ACRE
SPRAY-TO-WET		
Handgun, or Backpack	0.5 to 1.5% by volume	spray-to-wet*
LOW-VOLUME DIRECTED SPRAY		
Backpack	4 to 8% by volume	15 to 25**
Modified High-Volume	1.5 to 3% by volume	40 to 60**

* For applications made on a spray-to-wet basis, spray coverage should be uniform and complete. Do not spray to the point of runoff.

** Low-volume directed applications with backpacks work best when treating weeds and brush less than 10 feet tall. For taller weeds and brush, high-volume handguns can be modified by reducing nozzle size and spray pressure to produce a low-volume directed spray.

7.4 Selective Equipment

This product may be applied through shielded applicators, hooded sprayers, wiper applicators or sponge bars, after dilution and thorough mixing with water, to listed weeds growing in any aquatic or non-crop site specified on this label.

AVOID CONTACT OF HERBICIDE WITH DESIRABLE VEGETATION, AS SERIOUS INJURY OR DEATH IS LIKELY TO OCCUR.

Applicators used above desired vegetation should be adjusted so that the lowest wiper contact point is at least 2 inches above the desirable vegetation. Droplets, mist, foam or splatter of the herbicide solution settling on desirable vegetation is likely to result in discoloration, stunting or destruction.

Better results may be obtained when more of the weed is exposed to the herbicide solution. Weeds not contacted by the herbicide solution will not be affected. This may occur in dense clumps, severe infestations or when the height of the weeds varies so that not all weeds are contacted. In these instances, repeat treatment may be necessary.

Shielded and Hooded Applicators

A shielded or hooded applicator directs the herbicide solution onto weeds, while shielding desirable vegetation from the herbicide. Use nozzles that provide uniform coverage within the treated area. Keep shields on these sprayers adjusted to protect desirable vegetation. **EXTREME CARE MUST BE EXERCISED TO AVOID CONTACT OF HERBICIDE WITH DESIRABLE VEGETATION.**

Wiper Applicators and Sponge Bars

Wiper applicators are devices that physically wipe appropriate amounts of this product directly onto the weed. Equipment must be designed, maintained and operated to prevent the herbicide solution from contacting desirable vegetation. Operate this equipment at ground speeds no greater than 5 miles per hour. Performance may be improved by reducing speed in areas of heavy weed infestations to ensure adequate wiper saturation. Better results may be obtained if 2 applications are made in opposite directions.

Avoid leakage or dripping onto desirable vegetation. Adjust height of applicator to ensure adequate contact with weeds. Keep wiping surfaces clean. Be aware that, on sloping ground, the herbicide solution may migrate, causing dripping on the lower end and drying of the wicks on the upper end of a wiper applicator.

Do not use wiper equipment when weeds are wet.

Mix only the amount of solution to be used during a 1-day period, as reduced activity may result from use of leftover solutions. Clean wiper parts immediately after using this product by thoroughly flushing with water.

Nonionic surfactant at a rate of 10 percent by volume of total herbicide solution is recommended with all wiper applications.

For Rope or Sponge Wick Applicators—Solutions ranging from 33 to 75 percent of this product in water may be used.

For Panel Applicators—Solutions ranging from 33 to 100 percent of this product in water may be used in panel wiper applicators.

8.0 SITE AND USE INSTRUCTIONS

Detailed instructions follow alphabetically, by site.

Unless otherwise specified, applications may be made to control any weeds listed in the "ANNUAL WEEDS", "PERENNIAL WEEDS" and "WOODY BRUSH AND TREES" sections of "WEEDS CONTROLLED". Refer also to the "SELECTIVE EQUIPMENT" section.

8.1 Aquatic Sites

This product may be applied to emerged weeds in all bodies of fresh and brackish water which may be flowing, nonflowing or transient. This includes lakes, rivers, streams, ponds, estuaries, rice levees, seeps, irrigation and drainage ditches, canals, reservoirs, wastewater treatment facilities, wildlife habitat restoration and management areas, and similar sites.

This product may also be used to control the labeled weeds, woody brush and trees growing in other terrestrial non-crop sites listed on this label or in aquatic sites within these areas.

If aquatic sites are present in a non-crop area and are part of the intended treatment, read and observe the following directions:

This product does not control plants which are completely submerged or have a majority of their foliage under water.

There is no restriction on the use of treated water for irrigation, recreation or domestic purposes.

Consult local state fish and game agency and water control authorities before applying this product to public water. Permits may be required to treat such water.

NOTE: Do not apply this product **directly to water** within 0.5 mile upstream of an active potable water intake in flowing water (i.e., river, stream, etc.) or within 0.5 mile of an active potable water intake in a standing body of water such as lake, pond or reservoir. To make aquatic applications around and within 0.5 mile of active potable water intakes, the water intake must be turned off for a minimum period of 48 hours after the application. The water intake may be turned on prior to 48 hours if the glyphosate level in the intake water is below 0.7 parts per million as determined by laboratory analysis. These aquatic applications may be made **ONLY** in those cases where there are alternative water sources or holding ponds which would permit the turning off of an active potable water intake for a minimum period of 48 hours after the applications. This restriction does **NOT** apply to intermittent inadvertent overspray of water in terrestrial use sites.

For treatments after drawdown of water or in dry ditches, allow 7 or more days after treatment before reintroduction of water to achieve maximum weed control. Apply this product within 1 day after drawdown to ensure application to actively growing weeds.

Floating mats of vegetation may require retreatment. Avoid wash-off of sprayed foliage by spray boat or recreational boat backwash or by rainfall within 6 hours of application. Do not retreat within 24 hours following the initial treatment.

Applications made to moving bodies of water must be made while traveling upstream to prevent concentration of this herbicide in water. When making any bankside applications, do not overlap more than 1 foot into open water. Do not spray in bodies of water where weeds do not exist. The maximum application rate of 7.5 pints per acre must not be exceeded in any single broadcast application that is being made over water.

When emerged infestations require treatment of the total surface area of impounded water, treating the area in strips may avoid oxygen depletion due to decaying vegetation. Oxygen depletion may result in fish kill.

TANK MIXTURES: Tank mixtures of this product plus 2,4-D amine may be used to increase the spectrum of vegetation controlled in aquatic sites. Use 1.5 to 2 pints of this product plus 2 to 4 pints of 2,4-D amine (4 pounds active ingredient per gallon, labeled for aquatic sites) for control of annual weeds. Use 3 to 7.5 pints of this product plus 2 to 4 pints of 2,4-D amine (4 pounds per gallon, labeled for aquatic sites) for control or partial control of perennial weeds, woody brush and trees.

When tank mixing, read and carefully observe the label claims, cautionary statements and all information on the labels of all products used. Use according to the most restrictive precautionary statements for each product in the mixture. Mix in the following sequence: Fill sprayer tank one-half full with water, add AquaMaster herbicide, then 2,4-D amine and finally surfactant. Fill sprayer tank to final volume of water.

NOTE: DO NOT MIX AQUAMASTER HERBICIDE AND 2,4-D AMINE CONCENTRATES WITHOUT WATER CARRIER. DO NOT MIX AQUAMASTER HERBICIDE AND 2,4-D AMINE IN BYPASS INJECTOR-TYPE SPRAY EQUIPMENT.

8.2 Cut Stump

Cut stump treatments may be made on any site listed on this label. This product will control many types of woody brush and tree species. Apply this product using suitable equipment to ensure coverage of the entire cambium. Cut trees or resprouts close to the soil surface. Apply a 50- to 100-percent solution of this product to the freshly-cut surface **immediately after** cutting. Delays in application may result in reduced performance. For best results, applications should be made during periods of active growth and full leaf expansion.

DO NOT MAKE CUT STUMP APPLICATIONS WHEN THE ROOTS OF DESIRABLE WOODY BRUSH OR TREES MAY BE GRAFTED TO THE ROOTS OF THE CUT STUMP. Some sprouts, stems, or trees may share the same root system. Adjacent trees having a similar age, height and spacing may signal shared roots. Whether grafted or shared, injury is likely to occur to non-treated stems/trees when one or more trees sharing common roots are treated.

8.3 General Non-crop Areas and Industrial Sites

Use in areas such as airports, apartment complexes, ditch banks, dry ditches, dry canals, fencerows, golf courses, industrial sites, lumber yards, manufacturing sites, office complexes, parks, parking areas, petroleum tank farms and pumping installations, railroads, recreational areas, residential areas, roadsides, schools, storage areas, substations, warehouse areas, other public areas, and similar industrial and non-crop sites.

General Weed Control, Trim-and-Edge and Bare Ground

This product may be used in general non-crop areas. It may be applied with any application equipment described in this label. This product may be used to trim-and-edge around objects in non-crop sites, for spot treatment of unwanted vegetation and to eliminate unwanted weeds growing in established shrub beds or ornamental plantings. This product may be used prior to planting an area to ornamentals, flowers, turfgrass (sod or seed), or prior to laying asphalt or beginning construction projects.

Repeated applications of this product may be used, as weeds emerge, to maintain bare ground.

TANK MIXTURES: This product may be tank mixed with the following products. Refer to these products' labels for approved non-crop sites and application rates.

ARSENAL®	OUTRIDER®
BARRICADE® 65WG	PENDULUM® 3.3 EC
CLARITY®	PENDULUM WDG
DIURON	PLATEAU®
ENDURANCE®	PRINCEP® DF
ESCORT®	PRINCEP LIQUID
GARLON® 3A	RONSTAR® 50WP
GARLON 4	SAHARA®
HYVAR® X	SIMAZINE
KARMEX® DF	SURFLAN®
KROVAR® I DF	TELAR®
MANAGE®	VANQUISH®
OUST®	2,4-D

This product plus dicamba tank mixtures may not be applied by air in California.

Brush Control Tank Mixtures

TANK MIXTURES: Tank mixtures of this product may be used to increase the spectrum of control for herbaceous weeds, woody brush and trees. When tank mixing, read and carefully observe the label claims, cautionary statements and all information on the labels of all products used. Use according to the most restrictive precautionary statements for each product in the mixture. Any recommended rate of this product may be used in a tank mix.

For control of herbaceous weeds, use the lower recommended tank mixture rates. For control of dense stands or tough-to-control woody brush and trees, use the higher recommended rates.

NOTE: For side trimming treatments, it is recommended that this product be used alone or in tank mixture with Garlon 4.

PRODUCT	BROADCAST RATE
Arsenal 2WSL	6 to 32 fluid ounces per acre
Escort	1 to 2 ounces per acre
Garlon 3A*, Garlon 4	1 to 4 quarts per acre
PRODUCT	SPRAY-TO-WET RATES
Arsenal 2WSL	0.06 to 0.12% by volume
Escort	1 to 2 ounces per acre
PRODUCT	LOW-VOLUME DIRECTED SPRAY RATES
Arsenal 2 WSL	0.1 to 0.5% by volume
Escort	1 to 2 ounces per acre

* Ensure that Garlon 3A is thoroughly mixed with water according to label directions before adding this product. Have spray mixture agitating at the time this product is added to avoid spray compatibility problems.

8.4 Habitat Management

Habitat Restoration and Management

This product may be used to control exotic and other undesirable vegetation in habitat management and natural areas, including riparian and estuarine areas, rangeland and wildlife refuges. Applications can be made to allow recovery of native plant species, prior to planting desirable native species, and for similar broad-spectrum vegetation control requirements. Spot treatments can be made to selectively remove unwanted plants for habitat management and enhancement.

Wildlife Food Plots

This product may be used as a site preparation treatment prior to planting wildlife food plots. Any wildlife food species may be planted after applying this product, or native species may be allowed to repopulate the area. If tillage is needed to prepare a seedbed, wait 7 days after application before tillage to allow translocation into underground plant parts.

8.5 Injection and Frill (Woody Brush and Trees)

This product may be used to control woody brush and trees by injection or frill applications. Apply this product using suitable equipment that must penetrate into the living tissue. Apply the equivalent of 1/25 fluid ounce (1 milliliter) of this product per each 2 to 3 inches of trunk diameter at breast height (DBH). This is best achieved by applying a 50- to 100-percent concentration of this product either to a continuous frill around the tree or as cuts evenly spaced around the tree below all branches. As tree diameter increases in size, better results are achieved by applying diluted material to a continuous frill or more closely spaced cuttings. Avoid application techniques that allow runoff to occur from frilled or cut areas in species that exude sap freely. In species such as this, make the frill or cuts at an oblique angle to produce a cupping effect and use a 100 percent concentration of this product. For best results, application should be made during periods of active growth and after full leaf expansion.

8.6 Roadsides

All of the instructions in the "GENERAL NON-CROP AREAS AND INDUSTRIAL SITES" section apply to roadsides.

Shoulder Treatments

This product may be used on road shoulders. It may be applied with boom sprayers, shielded boom sprayers, high-volume offcenter nozzles, hand-held equipment, and similar equipment.

Guardrails and Other Obstacles to Mowing

This product may be used to control weeds growing under guardrails and around signposts and other objects along the roadside.

Spot Treatment

This product may be used as a spot treatment to control unwanted vegetation growing along roadsides.

TANK MIXTURES: This product may be tank mixed with the following products for shoulder, guardrail, spot and bare ground treatments, provided that the specific tank mixture product is labeled for this site:

CLARITY	PRINCEP DF
DIURON	PRINCEP LIQUID
ENDURANCE	RONSTAR 50WP
ESCORT	SAHARA
GARLON 4	SIMAZINE
KROVAR 1 DF	SURFLAN
OUST	TELAR
OUTRIDER	VANQUISH
PENDULUM 3.3EC	2,4-D
PENDULUM WDG	

See the "MIXING" section of this label for general instructions for tank mixing.

Release of Bermudagrass or Bahiagrass

Dormant Applications

This product may be used to control or partially control many winter annual weeds and tall fescue for effective release of dormant Bermudagrass or bahiagrass. Treat only when turf is dormant and prior to spring greenup. This product may also be tank mixed with Outrider herbicide or Oust for residual control. Tank mixtures of this product with Oust may delay greenup.

For best results on winter annuals, treat when plants are in an early growth stage (below 6 inches in height) after most have germinated. For best results on tall fescue, treat when fescue is at or beyond the 4- to 6-leaf stage.

Apply 6 to 48 fluid ounces of this product in a tank mixture with 0.75 to 1.3 ounces Outrider herbicide per acre. Read and follow all label directions for Outrider herbicide.

TANK MIXTURES: Apply 6 to 48 fluid ounces of this product per acre alone or in a tank mixture with 0.25 to 1 ounce per acre of Oust. Apply the recommended rates in 10 to 40 gallons of water per acre. Use only in areas where Bermudagrass or bahiagrass are desirable ground covers and where some temporary injury or discoloration can be tolerated. To avoid delays in greenup and minimize injury, add no more than 1 ounce of Oust per acre on Bermudagrass and no more than 0.5 ounce of Oust per acre on bahiagrass and avoid treatments when these grasses are in a semi-dormant condition.

Actively Growing Bermudagrass

This product may be used to control or partially control many annual and perennial weeds for effective release of actively growing Bermudagrass. Apply 12 to 36 fluid ounces of this product in 10 to 40 gallons of spray solution per acre. Use the lower rate when treating annual weeds below 6 inches in height (or runner length). Use the higher rate as weeds increase in size or as they approach flower or seedhead formation. These rates will also provide partial control of the following perennial species:

Bahiagrass	Johnsongrass
Bluestem, silver	Trumpetcreeper
Fescue, tall	Vaseygrass

This product may be tank mixed with Outrider herbicide for control or partial control of Johnsongrass and other weeds listed in the Outrider herbicide label. Use 6 to 24 fluid ounces of this product with 0.75 to 1.3 ounces of Outrider herbicide. Use the higher rates of both products for control of perennial weeds or annual weeds greater than 6 inches in height.

TANK MIXTURES: This product may be tank-mixed with Oust. If tank mixed, use no more than 12 to 24 fluid ounces of this product with 1 to 2 ounces of Oust per acre. Use the lower rates of each product to control annual weeds less than 6 inches in height (or runner length) that are listed in this label and the Oust label. Use the higher rates as annual weeds increase in size and approach the flower or seedhead stages. These rates will also provide partial control of the following perennial weeds:

Bahiagrass	Fescue, tall
Bluestem, silver	Johnsongrass
Broomsedge	Poorjoe
Dallisgrass	Trumpetcreeper
Dock, curly	Vaseygrass
Dogfennel	Vervain, blue

Use only on well-established Bermudagrass. Bermudagrass injury may result from the treatment, but regrowth will occur under moist conditions. Repeat applications of the tank mix in the same season are not recommended, since severe injury may occur.

Actively Growing Bahiagrass

For suppression of vegetative growth and seedhead inhibition of bahiagrass for approximately 45 days, apply 4 fluid ounces of this product in 10 to 40 gallons of water per acre. Apply 1 to 2 weeks after full greenup or after mowing to a uniform height of 3 to 4 inches. This application must be made prior to seedhead emergence.

For suppression up to 120 days, apply 3 fluid ounces of this product per acre, followed by an application of 2 to 3 fluid ounces per acre about 45 days later. Make no more than 2 applications per year.

This product may be used for control or partial control of Johnsongrass and other weeds listed on the Outrider herbicide label in actively growing bahiagrass. Apply 1.5 to 3.5 fluid ounces of this product with 0.75 to 1.3 ounces of Outrider herbicide per acre. Use the higher rates for control of perennial weeds or annual weeds greater than 6 inches in height. Use only on well established bahiagrass.

TANK MIXTURES: A tank mixture of this product plus Oust may be used. Apply 4 fluid ounces of this product plus 0.25 ounce of Oust per acre 1 to 2 weeks following an initial spring mowing. Make only one application per year.

9.0 WEEDS CONTROLLED

Always use the higher rate of this product per acre within the recommended range when weed growth is heavy or dense or weeds are growing in an undisturbed (noncultivated) area.

Reduced results may occur when treating weeds heavily covered with dust. For weeds that have been mowed, grazed or cut, allow regrowth to occur prior to treatment.

Refer to the following label sections for recommended rates for the control of annual and perennial weeds and woody brush and trees. For difficult to control perennial weeds and woody brush and trees, where plants are growing under stressed conditions, or where infestations are dense, this product may be used at 4.5 to 8 quarts per acre for enhanced results.

9.1 Annual Weeds

Apply to actively growing annual grasses and broadleaf weeds.

Allow at least 3 days after application before disturbing treated vegetation. After this period the weeds may be mowed, tilled or burned. See "GENERAL INFORMATION", "MIXING", and "APPLICATION EQUIPMENT AND TECHNIQUES" sections for labeled uses and specific application instructions.

Use 1.5 pints per acre if weeds are less than 6 inches in height or runner length and 1 to 4 quarts per acre if weeds are over 6 inches in height or runner length or when weeds are growing under stressed conditions.

For spray-to-wet applications, apply a 0.5-percent solution of this product to weeds less than 6 inches in height or runner length. Apply prior to seedhead formation in grass or bud formation in broadleaf weeds. For annual weeds over 6 inches tall, or for smaller weeds growing under stressed conditions, use a 0.75- to 1.5-percent solution. Use the higher rate for tough-to-control species or for weeds over 24 inches tall.

WEED SPECIES

Anoda, spurred	Fleabane, hairy
Balsamapple*	(<i>Conyza bonariensis</i>) *
Barley*	Fleabane, rough*
Barnyardgrass*	Florida pusley
Bittercress*	Foxtail*
Black nightshade*	Goatgrass, jointed*
Bluegrass, annual*	Goosegrass
Bluegrass, bulbous*	Grain sorghum (milo)*
Bassia, fivehook	Groundsel, common*
Brome, downy*	Hemp sesbania
Brome, Japanese*	Henbit
Broomsedge,	Horseweed/Marestail
Browntop panicum*	(<i>Conyza canadensis</i>)
Buttercup*	Itchgrass*
Carolina foxtail*	Johnsongrass, seedling
Carolina geranium	Junglerice
Castor bean	Knotweed
Cheatgrass*	Kochia
Cheeseweed	Lambsquarters*
(<i>Malva parviflora</i>)	Little barley*
Chervil*	London rocket*
Chickweed*	Mayweed
Cocklebur*	Medusahead*
Copperleaf, hophornbeam	Morningglory
Corn*	(<i>Ipomoea spp.</i>)
Corn speedwell*	Mustard, blue*
Crabgrass*	Mustard, tansy*
Dwarf dandelion*	Mustard, tumble*
Eastern manna grass*	Mustard, wild*
Eclipta*	Oats
Fall panicum*	Pigweed*
Falsedandelion*	Plains/Tickseed coreopsis*
Falseflax, smallseed*	Prickly lettuce*
Fiddleneck	Puncturevine
Field pennycress*	Purslane, common
Filaree	Ragweed, common*
Fleabane, annual*	Ragweed, giant

WEED SPECIES (Cont'd)

Red rice	Spurge, prostrate*
Russian thistle	Spurge, spotted*
Rye*	Spurry, umbrella*
Ryegrass*	Starthistle, yellow
Sandbur, field*	Stinkgrass*+
Shattercane*	Sunflower*
Shepherd's-purse*	Teaweed/Prickly sida
Sicklepod	Texas panicum*
Signalgrass, broadleaf*	Velvetleaf
Smartweed, ladysthumb*	Virginia copperleaf
Smartweed, Pennsylvania*	Virginia pepperweed*
Sowthistle, annual	Wheat*
Spanishneedles***	Wild oats*
Speedwell, purslane*	Witchgrass*
Sprangletop*	Woolly cupgrass*
Spurge, annual*	Yellow rocket

* When using field broadcast equipment (aerial applications or boom sprayers using flat-fan nozzles) these species will be controlled or partially controlled using 12 fluid ounces of this product per acre. Applications must be made using 3 to 10 gallons of carrier volume per acre. Use nozzles that ensure thorough coverage of foliage and treat when weeds are in an early growth stage.

** Apply with hand-held equipment only.

***Apply 3 pints of this product per acre.

9.2 Perennial Weeds

Best results are obtained when perennial weeds are treated after they reach the reproductive stage of growth (seedhead initiation in grasses and bud formation in broadleaves). For non-flowering plants, best results are obtained when the plants reach a mature stage of growth. In many situations, treatments are required prior to these growth stages. Under these conditions, use the higher application rate within the recommended range.

Ensure thorough coverage when using spray-to-wet treatments using hand-held equipment. When using hand-held equipment for low-volume directed spot treatments, apply a 4- to 8-percent solution of this product.

Allow 7 or more days after application before tillage. If weeds have been mowed or tilled, do not treat until regrowth has reached the recommended stages. Fall treatments must be applied before a killing frost.

Repeat treatments may be necessary to control weeds regenerating from underground parts or seed.

WEED SPECIES	RATE (QT/A)	HAND-HELD % SOLUTION
Alfalfa*	0.7	1.5
Alligatorweed*	3.0	1.3
Anise (fennel)	1.5-3.0	1.0-1.5
Bahiagrass	2.3-3.75	1.5
Beachgrass, European (<i>Ammophila arenaria</i>)	—	3.5
Bentgrass*	1.0	1.5
Bermudagrass	4.0	1.5
Bermudagrass, water (knotgrass)	1.0	1.5
Bindweed, field	3.0-3.75	1.5
Bluegrass, Kentucky	1.5-2.3	0.75
Blueweed, Texas	3.0-3.75	1.5
Brackenfern	2.3-3.0	0.75-1.0
Bromegrass, smooth	1.5-2.3	0.75
Bursage, woolly-leaf	—	1.5
Canarygrass, reed	1.5-2.3	0.75
Cattail	2.3-3.75	0.75
Clover; red, white	2.3-3.75	1.5
Cogongrass	2.3-3.75	1.5
Cordgrass	2.3-3.75	1.0-2.0
Cutgrass, giant	3.0	1.0
Dallisgrass	2.3-3.75	1.5
Dandelion	2.3-3.75	1.5
Dock, curly	2.3-3.75	1.5
Dogbane, hemp	3.0	1.5
Fescue (except tall)	2.3-3.75	1.5
Fescue, tall	2.3	1.0
Guineagrass	2.3	0.75
Horsenettle	2.3-3.75	1.5
Horseradish	3.0	1.5
Iceplant	1.5	1.5
Ivy, German, cape	1.5-3.0	0.75-1.5
Jerusalem artichoke	2.3-3.75	1.5
Johnsongrass	1.5-2.3	0.75
Kikuyugrass	1.5-2.3	0.75
Knapweed	3.0	1.5
Lantana	—	0.75-1.0
Lespedeza	2.3-3.75	1.5

Loosestrife, purple	2.0	1.0-1.5
Lotus, American	2.0	0.75
Maidencane	3.0	0.75
Milkweed, common	2.3	1.5
Muhly, wirestem	1.5-2.3	0.75
Mullein, common	2.3-3.75	1.5
Napiergrass	2.3-3.75	1.5
Nightshade, silverleaf	3.0-3.75	1.5
Nutsedge; purple, yellow	2.3	0.75
Orchardgrass	1.5-2.3	0.75
Pampasgrass	2.3-3.75	1.5
Paragrass	3.0	0.75
Pepperweed, perennial	3.0	1.5
Phragmites*	2.0-3.75	0.75-1.5
Poison hemlock	1.5-3.0	0.75-1.5
Quackgrass	1.5-2.3	0.75
Redvine*	1.5	1.5
Reed, giant	3.0-3.75	1.5
Ryegrass, perennial	1.5-2.3	0.75
Salvinia, (<i>spp.</i>)	—	2.0
Smartweed, swamp	2.3-3.75	1.5
Spatterdock	3.0	0.75
Spurge, leafy*	—	1.5
Starthistle, Yellow	—	1.5
Sweet potato, wild*	—	1.5
Thistle, artichoke	1.5-2.3	2.0
Thistle, Canada	1.5-2.3	1.5
Timothy	1.5-2.3	1.5
Torpedograss*	3.0-3.75	0.75-1.5
Trumpetcreeper*	1.5-2.3	1.5
Tules, common	—	1.5
Vaseygrass	2.3-3.75	1.5
Velvetgrass	2.3-3.75	1.5
Waterhyacinth	2.5-3.0	0.75-1.0
Waterlettuce	—	0.75-1.0
Waterprimrose	—	0.75
Wheatgrass, western	1.5-2.3	0.75

*Partial control

Alligatorweed—Apply 6 pints of this product per acre as a broadcast spray or as a 1.3-percent solution with hand-held equipment to provide partial control of alligatorweed. Apply when most of the target plants are in bloom. Repeat applications will be required to maintain such control.

Beachgrass, European—Apply an 8-percent solution of this products plus 0.5- to 1.5-percent nonionic surfactant on a low-volume spray-to-wet basis. Best results are obtained when applications are made when European beachgrass is actively growing through the boot to the full heading stages of growth. Make applications prior to the loss of more than 50 percent green leaf color in the fall. Do not treat when weeds are under drought stress. Repeat applications may be necessary.

Bermudagrass—Apply 7.5 pints of this product per acre as a broadcast spray or as a 1.5-percent solution with hand-held equipment. Apply when target plants are actively growing and when seedheads appear.

Bindweed, field / Silverleaf Nightshade / Texas Blueweed—Apply 6 to 7.5 pints of this product per acre as a broadcast spray west of the Mississippi River and 4.5 to 6 pints of this product per acre east of the Mississippi River. With hand-held equipment, use a 1.5-percent solution. Apply when target plants are actively growing and are at or beyond full bloom. For silverleaf nightshade, best results can be obtained when application is made after berries are formed. Do not treat when weeds are under drought stress. New leaf development indicates active growth. For best results apply in late summer or fall.

Brackenfern—Apply 4.5 to 6 pints of this product per acre as a broadcast spray or as a 0.75- to 1-percent solution with hand-held equipment. Apply to fully expanded fronds which are at least 18 inches long.

Cattail—Apply 4.5 to 6 pints of this product per acre as a broadcast spray or as a 0.75-percent solution with hand-held equipment. Apply when target plants are actively growing and are at or beyond the early-to-full bloom stage of growth. Best results are achieved when application is made during the summer or fall months.

Cogongrass—Apply 4.5 to 7.5 pints of this product per acre as a broadcast spray. Apply when cogongrass is at least 18 inches tall and actively growing in late summer or fall. Allow 7 or more days after application before tillage or mowing. Due to uneven stages of growth and the dense nature of vegetation preventing good spray coverage, repeat treatments may be necessary to maintain control.

Cordgrass—Apply 4.5 to 7.5 pints of this product per acre as a broadcast spray or as a 1- to 2-percent solution with hand-held equipment. Schedule applications in order to allow 6 hours before treated plants are covered by tidewater. The presence of debris and silt on the cordgrass plants will reduce performance. It may be necessary to wash targeted plants prior to application to improve uptake of this product into the plant.

Cutgrass, giant—Apply 6 pints of this product per acre as a broadcast spray or as a 1-percent solution with hand-held equipment to provide partial control of giant cutgrass. Repeat applications will be required to maintain such control, especially where vegetation is partially submerged in water. Allow for substantial regrowth to the 7- to 10-leaf stage prior to retreatment.

Dogbane, hemp / Knapweed / Horseradish—Apply 6 pints of this product per acre as a broadcast spray or as a 1.5-percent solution with hand-held equipment. Apply when target plants are actively growing and most have reached the late bud-to-flower stage of growth. For best results, apply in late summer or fall.

Fescue, tall—Apply 4.5 pints of this product per acre as a broadcast spray or as a 1-percent solution with hand-held equipment. Apply when target plants are actively growing and most have reached the boot-to-head stage of growth. When applied prior to the boot stage, less desirable control may be obtained.

Guineagrass—Apply 4.5 pints of this product per acre as a broadcast spray or as a 0.75-percent solution with hand-held equipment. Apply when target plants are actively growing and when most have reached at least the 7-leaf stage of growth.

Johnsongrass / Bluegrass, Kentucky / Bromegrass, smooth / Canarygrass, reed / Orchardgrass / Ryegrass, perennial / Timothy / Wheatgrass, western—Apply 3 to 4.5 pints of this product per acre as a broadcast spray or as a 0.75-percent solution with hand-held equipment. Apply when target plants are actively growing and most have reached the boot-to-head stage of growth. When applied prior to the boot stage, less desirable control may be obtained. In the fall, apply before plants have turned brown.

Lantana—Apply this product as a 0.75- to 1-percent solution with hand-held equipment. Apply to actively growing lantana at or beyond the bloom stage of growth. Use the higher application rate for plants that have reached the woody stage of growth.

Loosestrife, purple—Apply 4 pints of this product per acre as a broadcast spray or as a 1- to 1.5-percent solution using hand-held equipment. Treat when plants are actively growing at or beyond the bloom stage of growth. Best results are achieved when application is made during summer or fall months. Fall treatments must be applied before a killing frost.

Lotus, American—Apply 4 pints of this product per acre as a broadcast spray or as a 0.75-percent solution with hand-held equipment. Treat when plants are actively growing at or beyond the bloom stage of growth. Best results are achieved when application is made during summer or fall months. Fall treatments must be applied before a killing frost. Repeat treatment may be necessary to control regrowth from underground parts and seeds.

Maidencane / Paragrass—Apply 6 pints of this product per acre as a broadcast spray or as a 0.75-percent solution with hand-held equipment. Repeat treatments will be required, especially to vegetation partially submerged in water. Under these conditions, allow for regrowth to the 7- to 10-leaf stage prior to retreatment.

Milkweed, common—Apply 4.5 pints of this product per acre as a broadcast spray or as a 1.5-percent solution with hand-held equipment. Apply when target plants are actively growing and most have reached the late bud-to-flower stage of growth.

Nutsedge; purple, yellow—Apply 4.5 pints of this product per acre as a broadcast spray, or as a 0.75-percent solution with hand-held equipment to control existing nutsedge plants and immature nutlets attached to treated plants. Apply when target plants are in flower or when new nutlets can be found at rhizome tips. Nutlets which have not germinated will not be controlled and may germinate following treatment. Repeat treatments will be required for long-term control.

Pampasgrass—Apply a 1.5-percent solution of this product with hand-held equipment when plants are actively growing.

Phragmites—For partial control of phragmites in Florida and the counties of other states bordering the Gulf of Mexico, apply 7.5 pints per acre as a broadcast spray or apply a 1.5- percent solution with hand-held equipment. In other areas of the U.S., apply 4 to 6 pints per acre as a broadcast spray or apply a 0.75-percent solution with hand-held equipment for partial control. For best results, treat during late summer of fall months when plants are actively growing and in full bloom. Due to the dense nature of the vegetation, which may prevent good spray coverage and uneven stages of growth, repeat treatments may be necessary to maintain control. Visual control symptoms will be slow to develop.

Quackgrass / Kikuyugrass / Muhly, wirestem—Apply 3 to 4.5 pints of this product per acre as a broadcast spray or as a 0.75-percent solution with hand-held equipment when most quackgrass or wirestem muhly is at least 8 inches in height (3- to 4-leaf stage of growth) and actively growing. Allow 3 or more days after application before tillage.

Reed, giant / Ice Plant—For control of giant reed and ice plant, apply a 1.5-percent solution of this product with hand-held equipment when

plants are actively growing. For giant reed, best results are obtained when applications are made in late summer to fall.

Spatterdock—Apply 6 pints of this product per acre as a broadcast spray or as a 0.75-percent solution with hand-held equipment. Apply when most plants are in full bloom. For best results, apply during the summer or fall months.

Sweet potato, wild—Apply this product as a 1.5-percent solution using hand-held equipment. Apply to actively growing weeds that are at or beyond the bloom stage of growth. Repeat applications will be required. Allow the plant to reach the recommended stage of growth before retreatment.

Thistle; Canada, artichoke—Apply 3 to 4.5 pints of this product per acre as a broadcast spray or as a 1.5-percent solution with hand-held equipment for Canada thistle. To control artichoke thistle, apply a 2-percent solution as a spray-to-wet application. Apply when target plants are actively growing and are at or beyond the bud stage of growth.

Torpedograss—Apply 6 to 7.5 pints of this product per acre as a broadcast spray or as a 0.75- to 1.5-percent solution with hand-held equipment to provide partial control of torpedograss. Use the lower rates under terrestrial conditions, and the higher rates under partially submerged or a floating mat condition. Repeat treatments will be required to maintain such control.

Tules, common—Apply this product as a 1.5-percent solution with hand-held equipment. Apply to actively growing plants at or beyond the seed-head stage of growth. After application, visual symptoms will be slow to appear and may not occur for 3 or more weeks.

Waterhyacinth—Apply 5 to 6 pints of this product per acre as a broadcast spray or apply a 0.75- to 1-percent solution with hand-held equipment. Apply when target plants are actively growing and at or beyond the early bloom stage of growth. After application, visual symptoms may require 3 or more weeks to appear with complete necrosis and decomposition usually occurring within 60 to 90 days. Use the higher rates when more rapid visual effects are desired.

Waterlettuce—For control, apply a 0.75- to 1-percent solution of this product with hand-held equipment to actively growing plants. Use higher rates where infestations are heavy. Best results are obtained from mid-summer through winter applications. Spring applications may require retreatment.

Waterprimrose—Apply this product as a 0.75-percent solution using hand-held equipment. Apply to plants that are actively growing at or beyond the bloom stage of growth, but before fall color changes occur. Thorough coverage is necessary for best control.

Other perennials listed on this label—Apply 4.5 to 7.5 pints of this product per acre as a broadcast spray or as a 0.75- to 1.5-percent solution with hand-held equipment. Apply when target plants are actively growing and most have reached early head or early bud stage of growth.

9.3 Woody Brush and Trees

Apply this product after full leaf expansion, unless otherwise directed. Use the higher rate for larger plants and/or dense areas of growth. On vines, use the higher rate for plants that have reached the woody stage of growth. Best results are obtained when application is made in late summer or fall after fruit formation.

In arid areas, best results are obtained when applications are made in the spring to early summer when brush species are at high moisture content and are flowering.

Ensure thorough coverage when using spray-to-wet treatments using hand-held equipment. When using hand-held equipment for low-volume directed-spray spot treatments, apply a 4- to 8-percent solution of this product.

Symptoms may not appear prior to frost or senescence with fall treatments.

Allow 7 or more days after application before tillage, mowing or removal. Repeat treatments may be necessary to control plants regenerating from underground parts or seed. Some autumn colors on undesirable deciduous species are acceptable provided no major leaf drop has occurred. Reduced performance may result if fall treatments are made following a frost.

WEED SPECIES	BROADCAST RATE (QT/A)	HAND-HELD SPRAY-TO-WET % SOLUTION
Alder	2.3-3.0	0.75-1.2
Ash*	1.5-3.75	0.75-1.5
Aspen, quaking	1.5-2.3	0.75-1.2
Bearclover (Bearmat)*	1.5-3.75	0.75-1.5
Beech*	1.5-3.75	0.75-1.5
Birch	1.5	0.75
Blackberry	2.3-3.0	0.75-1.2
Blackgum	1.5-3.75	0.75-1.5
Bracken	1.5-3.75	0.75-1.5
Broom; French, Scotch	1.5-3.75	1.2-1.5

WEED SPECIES	BROADCAST RATE (QT/A)	HAND-HELD SPRAY-TO-WET % SOLUTION
Buckwheat, California*	1.5-3.0	0.75-1.5
Cascara*	1.5-3.75	0.75-1.5
Castor bean	—	1.5
Catsclaw*	—	1.2-1.5
Ceanothus*	1.5-3.75	0.75-1.5
Chamise*	1.5-3.75	0.75
Cherry; bitter, black, pin	1.5-3.75	1.0-1.5
Cottonwood, eastern	1.5-3.75	0.75-1.5
Coyote brush	2.3-3.0	1.2-1.5
Cypress, swamp, bald	1.5-3.75	0.75-1.5
Deerweed	1.5-3.75	0.75-1.5
Dewberry	2.3-3.0	0.75-1.2
Dogwood*	3.0-3.75	1.0-2.0
Elderberry	1.5	0.75
Elm*	1.5-3.75	0.75-1.5
Eucalyptus	—	1.5
Gallberry	1.5-3.75	0.75-1.5
Gorse*	1.5-3.75	0.75-1.5
Hackberry, western	1.5-3.75	0.75-1.5
Hasardia*	1.5-3.0	0.75-1.5
Hawthorn	1.5-2.3	0.75-1.2
Hazel	1.5	0.75
Hickory*	3.0-3.75	1.0-2.0
Honeysuckle	2.3-3.0	0.75-1.2
Hornbeam, American*	1.5-3.75	0.75-1.5
Huckleberry	1.5-3.75	0.75-1.5
Knotweed, Japanese and Giant**	—	—
Kudzu	3.0	1.5
Locust, black*	1.5-3.0	0.75-1.5
Madrone sprouts*	—	1.5
Magnolia, sweetbay	1.5-3.75	0.75-1.5
Manzanita*	1.5-3.75	0.75-1.5
Maple, red	1.0-3.75	0.75-1.2
Maple, sugar	—	0.75-1.2
Maple, vine*	1.5-3.75	0.75-1.5
Monkey flower*	1.5-3.0	0.75-1.5
Oak; black, white*	1.5-3.0	0.75-1.5
Oak, northern pin	1.5-3.0	0.75-1.2
Oak, post	2.3-3.0	0.75-1.2
Oak, red	—	0.75-1.2
Oak, Scrub*	1.5-3.0	0.75-1.5
Oak, southern red	1.5-3.75	1.0-1.5
Orange, Osage	1.5-3.75	0.75-1.5
Peppertree, Brazilian (Florida holly)*	1.5-3.75	1.5
Persimmon*	1.5-3.75	0.75-1.5
Pine	1.5-3.75	0.75-1.5
Poison ivy	3.0-3.75	1.5
Poison oak	3.0-3.75	1.5
Poplar, yellow*	1.5-3.75	0.75-1.5
Prunus	1.5-3.75	1.0-1.5
Raspberry	2.3-3.0	0.75-1.2
Redbud, eastern	1.5-3.75	0.75-1.5
Redcedar, eastern	1.5-3.75	0.75-1.5
Rose, multiflora	1.5	0.75
Russian olive*	1.5-3.75	0.75-1.5
Sage, black	1.5-3.0	0.75
Sage, white*	1.5-3.0	0.75-1.5
Sage brush, California	1.5-3.0	0.75
Salmonberry	1.5	0.75
Saltbush	—	1.0
Saltcedar**	1.5-3.75	0.75-1.5
Sassafras*	1.5-3.75	0.75-1.5
Sea Myrtle	—	1.0
Sourwood*	1.5-3.75	0.75-1.5
Sumac; laurel, poison, smooth, sugarbush, winged*	1.5-3.0	0.75-1.5
Sweetgum	1.5-2.3	0.75-1.5
Swordfern*	1.5-3.75	0.75-1.5
Tallowtree, Chinese	—	0.75
Tan oak sprouts*	—	1.5
Thimbleberry	1.5	0.75
Tobacco, tree*	1.5-3.0	0.75-1.5
Toyon*	—	1.5
Trumpet creeper	1.5-2.3	0.75-1.2
Virginia creeper	1.5-3.75	0.75-1.5
Waxmyrtle, southern*	1.5-3.75	1.5
Willow	2.3	0.75
Yerbasanta, California*	—	1.5

*Partial control

**Refer to specific instructions below

Alder / Blackberry / Dewberry / Honeysuckle / Oak, Post / Raspberry—For control, apply 4.5 to 6 pints per acre as a broadcast spray or as a 0.75- to 1.2-percent solution with hand-held equipment.

Aspen, Quaking / Hawthorn / Trumpet creeper—For control, apply 3 to 4.5 pints of this product per acre as a broadcast spray or as a 0.75- to 1.2-percent solution with hand-held equipment.

Birch / Elderberry / Hazel / Salmonberry / Thimbleberry—For control, apply 3 pints per acre of this product as a broadcast spray or as a 0.75-percent solution with hand-held equipment.

Broom; French, Scotch—For control, apply a 1.2- to 1.5-percent solution with hand-held equipment.

Buckwheat, California / Hasardia / Monkey Flower / Tobacco, Tree—For partial control of these species, apply a 0.75- to 1.5-percent solution of this product as a foliar spray with hand-held equipment. Thorough coverage of foliage is necessary for best results.

Castorbean—For control, apply a 1.5-percent solution of this product with hand-held equipment.

Catsclaw—For partial control, apply a 1.2- to 1.5-percent solution with hand-held equipment when at least 50 percent of the new leaves are fully developed.

Cherry; Bitter, Black, Pin / Oak, Southern Red / Sweetgum / Prunus—For control, apply 3 to 7.5 pints of this product per acre as a broadcast spray or as a 1- to 1.5-percent solution with hand-held equipment.

Coyote brush—For control, apply a 1.2- to 1.5-percent solution with hand-held equipment when at least 50 percent of the new leaves are fully developed.

Dogwood / Hickory—For partial control, apply a 1- to 2-percent solution of this product with hand-held equipment or 6 to 7.5 pints per acre as a broadcast spray.

Eucalyptus, bluegum—For control of eucalyptus sprouts, apply a 1.5-percent solution of this product with hand-held equipment when sprouts are 6- to 12-feet tall. Ensure complete coverage. Apply when plants are actively growing. Avoid application to drought-stressed plants.

Knotweed, Japanese and Giant (*Polygonum cuspidatum* and *P. sachalinense*)

Stem Injection. Apply 0.18 fluid ounce (5 mL) of this below the 2nd or 3rd node above the ground of each stem in the clump. Use suitable equipment that must penetrate into the internode region.

Cut Stem. Cut stems cleanly just below the 2nd or 3rd node above the ground. Immediately apply 0.36 fluid ounce (10 milliliter) of a 50-percent solution of this product into the 'well' or remaining internode. Ensure that removed upper plant material is carefully gathered and discarded so that it will not contact soil and regenerate plants from sprouting buds. Use of a bio-barrier such as cardboard, plywood or plastic sheeting is recommended. The combined total for all treatments must not exceed 8 quarts per acre. At 5 milliliter per stem, or 10 milliliter of a 50-percent solution, 1514 stems per acre may be treated.

Kudzu—For control, apply 6 pints of this product per acre as a broadcast spray or as a 1.5-percent solution with hand-held equipment. Repeat applications will be required to maintain control.

Maple, Red—For control, apply as a 0.75- to 1.2-percent solution with hand-held equipment when leaves are fully developed. For partial control, apply 2 to 7.5 pints of this product per acre as a broadcast spray.

Maple, Sugar / Oak; Northern Pin, Red—For control, apply as a 0.75- to 1.2-percent solution with hand-held equipment when at least 50 percent of the new leaves are fully developed.

Peppertree, Brazilian (Holly, Florida) / Waxmyrtle, southern—For partial control, apply this product as a 1.5-percent solution with hand-held equipment.

Poison Ivy / Poison Oak—For control, apply 6 to 7.5 pints of this product per acre as a broadcast spray or as a 1.5-percent solution with hand-held equipment. Repeat applications may be required to maintain control. Fall treatments must be applied before leaves lose green color.

Rose, multiflora—For control, apply 3 pints of this product per acre as a broadcast spray or as a 0.75-percent solution with hand-held equipment. Treatments should be made prior to leaf deterioration by leaf-feeding insects.

Sage, black / Sagebrush, California / Chamise / Tallowtree, Chinese—For control of these species, apply a 0.75-percent solution of this product as a foliar spray with hand-held equipment. Thorough coverage of foliage is necessary for best results.

Saltbush, Sea myrtle—For control, apply this product as a 1-percent solution with hand-held equipment.

Saltcedar—For partial control, apply a 1- to 2-percent solution of this product with hand-held equipment or 6 to 7.5 pints per acre as a broadcast spray. For control, apply a 1- to 2-percent solution of this product mixed with 0.25 percent Arsenal 2WSL with hand-held equipment. For

control using broadcast applications, apply 3 pints of this product in a tank mix with 1 pint of Arsenal 2WSL to plants less than 6 feet tall. To control saltcedar greater than 6 feet tall using broadcast applications, apply 6 pints of this product in a tankmix with 2 pints of Arsenal 2WSL.

Willow—For control, apply 4.5 pints of this product per acre as a broadcast spray or as a 0.75-percent solution with hand-held equipment.

Other woody brush and trees listed in this label—For partial control, apply 3 to 7.5 pints of this product per acre as a broadcast spray or as a 0.75- to 1.5-percent solution with hand-held equipment.

10.0 LIMIT OF WARRANTY AND LIABILITY

Monsanto Company warrants that this product conforms to the chemical description on the label and is reasonably fit for the purposes set forth in the Complete Directions for Use label booklet ("Directions") when used in accordance with those Directions under the conditions described therein. NO OTHER EXPRESS WARRANTY OR IMPLIED WARRANTY OF FITNESS FOR PARTICULAR PURPOSE OR MERCHANTABILITY IS MADE. This warranty is also subject to the conditions and limitations stated herein.

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ST. LOUIS, MISSOURI, 63167 U.S.A.



Adjuvants Approved for Use on BLM Lands

Updated: December 2005

ADJUVANT CLASS	ADJUVANT TYPE	TRADE NAME	MANUFACTURER	COMMENTS
Surfactant	Non-ionic	Spec 90/10	Helena	
		Optima	Helena	CA Reg. No. 5905-50075-AA
		Induce	Setre (Helena)	CA Reg. No. 5905-50066-AA
		Activator 90	Loveland	CA Reg. No. 34704-50034-AA
		LI-700	Loveland	CA Reg. No. 36208-50022 WA Reg. No. AW36208-70004
		Spreader 90	Loveland	WA Reg. No. 34704-05002-AA
		UAP Surfactant 80/20	Loveland	
		X-77	Loveland	CA Reg. No. 36208-50023
		Cornbelt Premier 90	Van Diest Supply Co.	
		Spray Activator 85	Van Diest Supply Co.	
		R-11	Wilbur-Ellis	CA Reg. No. 2935-50142
		R-900	Wilbur-Ellis	
		Super Spread 90	Wilbur-Ellis	WA Reg. No. AW-2935-70016
		Super Spread 7000	Wilbur-Ellis	CA Reg. No. 2935-50170 WA Reg. No. AW-2935-0002
	Spreader/Sticker	Cohere	Helena	CA Reg. No. 5905-50083-AA
		R-56	Wilbur-Ellis	CA Reg. No. 2935-50144
		Bond	Loveland	CA Reg. No. 36208-50005
		Tactic	Loveland	CA Reg. No. 34704-50041-AA
		Lastick	Setre (Helena)	
	Silicone-based	Aero Dyne-Amic	Helena	CA Reg. No. 5905-50080-AA
		Dyne-Amic	Helena	CA Reg. No. 5095-50071-AA
		Kinetic	Setre (Helena)	CA Reg. No. 5905-50087-AA
		Phase	Loveland	CA Reg. No. 34704-50037-AA
		Silwet L-77	Loveland	CA Reg. No. 36208-50025
		Sylgard 309	Wilbur-Ellis	CA Reg. No. 2935-50161
		Syl-Tac	Wilbur-Ellis	CA Reg. No. 2935-50167
Oil-based	Crop Oil Concentrate	Crop Oil Concentrate	Helena	CA Reg. No. 5905-50085-AA
		Crop Oil Concentrate	Loveland	
		Herbimax	Loveland	CA Reg. No. 34704-50032-AA WA Reg. No. 34704-04006
		R.O.C. Rigo Oil Conc.	Wilbur-Ellis	
		Mor-Act	Wilbur-Ellis	CA Reg. No. 2935-50098
	Methylated Seed Oil	Methylated Spray		
		Oil Conc.	Helena	
		MSO Concentrate	Loveland	CA Reg. No. 34704-50029-AA WA Reg. No. 34704-04009
		Hasten	Wilbur-Ellis	CA Reg. No. 2935-50160 WA Reg. No. 2935-02004

ADJUVANT CLASS	ADJUVANT TYPE	TRADE NAME	MANUFACTURER	COMMENTS
	Methylated Seed Oil (cont.)	Super Spread MSO	Wilbur-Ellis	
	Vegetable Oil	Amigo	Loveland	CA Reg. No. 34704-50028-AA WA Reg. No. 34704-04002
		Competitor	Wilbur-Ellis	CA Reg. No. 2935-50173 WA Reg. No. AW-2935-04001
Fertilizer-based	Nitrogen-based	Quest	Setre (Helena)	CA Reg. No. 5905-50076-AA
		Dispatch	Loveland	
		Dispatch 111	Loveland	
		Dispatch 2N	Loveland	
		Dispatch AMS	Loveland	
		Bronc	Wilbur-Ellis	
		Bronc Max	Wilbur-Ellis	
		Bronc Max EDT	Wilbur-Ellis	
		Bronc Plus Dry EDT	Wilbur-Ellis	WA Reg. No. 2935-03002
		Cayuse Plus	Wilbur-Ellis	CA Reg. No. 2935-50171
Special Purpose or Utility	Buffering Agent	Buffers P.S.	Helena	CA Reg. No. 5905-50062-ZA
		Tri-Fol	Wilbur-Ellis	CA Reg. No. 2935-50152
	Colorants	Signal	Precision	
		Hi-Light	Becker-Underwood	
		Hi-Light WSP	Becker-Underwood	
	Compatibility/ Suspension Agent	E Z MIX	Loveland	CA Reg. No. 36208-50006
		Support	Loveland	WA Reg. No. 34704-04011
		Blendex VHC	Setre (Helena)	
	Deposition Aid	ProMate Impel	Helena	
		Pointblank	Helena	CA Reg. No. 52467-50008-AA-5905
		Intac Plus	Loveland	
		Liberate	Loveland	CA Reg. No. 34704-50030-AA WA Reg. No. 34704-04008
		Weather Gard	Loveland	CA Reg. No. 34704-50042-AA
		Bivert	Wilbur-Ellis	CA Reg. No. 2935-50163
		EDT Concentrate	Wilbur-Ellis	
		Sta Put	Setre (Helena)	CA Reg. No. 5905-50068-AA
	Defoaming Agent	No Foam	Wilbur-Ellis	CA Reg. No. 2935-50136
		Foam Buster	Setre (Helena)	CA Reg. No. 5905-50072-AA
		Cornbelt Defoamer	Van Diest Supply Co.	
	Diluent/Deposition Agent	Improved JLB Oil Plus	Brewer International	
	Foam Marker	Align	Helena	
		R-160	Wilbur-Ellis	
	Invert Emulsion Agent	Redi-vert II	Wilbur-Ellis	CA Reg. No. 2935-50168

ADJUVANT CLASS	ADJUVANT TYPE	TRADE NAME	MANUFACTURER	COMMENTS
	Tank Cleaner	Wipe Out	Helena	
		Kutter	Wilbur-Ellis	
		Neutral-Clean	Wilbur-Ellis	
		Cornbelt Tank-Aid	Van Diest Supply Co.	
	Water Conditioning	Blendmaster	Loveland	
		Choice	Loveland	CA Reg. No. 34704-50027-AA WA Reg. No. 34704-04004
		Choice Xtra	Loveland	
		Choice Weather Master	Loveland	CA Reg. No. 34704-50038-AA